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EDITORIAL NOTES.

Coal Present and Future—A Great Ambition.

IT would be a very fine thing if out of the evil of the recent and present coal situation some real good came; but it is only by something in the nature of persistent agitation that anything in the way of advantage to the country is likely to be brought about. Politically the country is rent in two by questions of Home Rule, Welsh Church Disestablishment, the Reconstitution of the House of Lords, and other topics; but really of greater importance to the national welfare is the position in which the country has been placed in regard to the coal supply since the great strike of 1912. But while home industries have been groaning and complaining, while the upper and middle-class householders have been reluctantly paying an increased fuel bill, and while the poor, buying in small quantities, have been sweated in order to make profits for the coal owners and the middlemen, our legislators have taken no notice of these things, and, with the prospect of easier conditions, they will be allowed to drift until the whole country, through perhaps a happening similar to that of 1912, will once more be ridden over roughshod by those who control the coal sources of the country. There is now no denying the fact that the coal strike of 1912 has been the creator of vast profit to the coal owners, and of considerable advantage to the coal miners; while the concatenation of circumstances in relation to coal connected with and succeeding that strike has been to the national detriment. What makes the position worse for home buyers is that, since the strike, and despite heavy prices, the demand made upon the collieries by foreign buyers has enormously exceeded former record. This position shows that, to obtain British coal, foreign users are not at all averse to paying high prices for it. Therefore, the facts of a big and growing export at high prices are among the best arguments in favour of the reimposition of the coal tax, which Mr. Charles Carpenter, D.Sc., in his address to the proprietors of the South Metropolitan Gas Company on Wednesday last, again advocated as a protection of national interests, and as having in it mutual benefit for the people of this country and the coal owners and the miners. Probably, as usual, the coal owners directly, or indirectly through agents, will sneer at the suggestions; but the facts have been vastly strengthened by events that go to support what is so widely regarded as a politic measure.

We have, however, no confidence that such reimposition will come early, if ever, however politic it may be. But if it is to come, now is the time, and there could be no better, for legislative action in the matter. Last year saw some extra 9 million tons of coal go out of the country, and more millions of pounds than these tons constituted the enhanced value of the exported coal. When and where is to be the end of the marvellous increases in coal exports? No one seems to be capable of telling. But Mr. Carpenter quotes the "Colliery Guardian" as responsible for the statement that the export of coal is growing so rapidly that it was recently declared that all developments in collieries have done little more than keep pace with increases in exports. This being so, while prices may fluctuate, advances in the volume of the coal exports must, under existing conditions, have the effect of gradually reducing the downward sweep of the fluctuations and of gradually increasing their upward sweep. Whatever may be in store for us in the immediate future as to lower prices, the prospect, taken as a whole, is not the one that could be desired. There is in this a good reason for keeping alive the subject of the baneful effect upon home industries of the export of British coal; for all the bluff, ridicule, and attempt to disparage the intelligence of people who are not in the coal trade cannot destroy or hide the accumulated facts and experiences of recent times. Among the baneful effects of the position is that the gas industry has not in the past year been able to make sufficient profits to pay a very moderate trading dividend; and, if the industry charges its gas consumers more, then down goes this moderate dividend. This is a position that is diametrically opposed to the one occupied by the coal proprietors, for, the more they can make the purchasers of coal pay per ton, the more they enlarge the profit with which to pad their fortunes. The position of the gas industry in this matter confers upon it a very strong claim to consideration of its views; and running nearly throughout the administration of the gas industry is the settled belief that a tax upon export coal would be of benefit to the country, and, Mr. Carpenter believes, to the coal owners.

The revenue from such a tax would be very useful to the country in these times. More war vessels are wanted for the maintenance of British supremacy in relation to the naval programmes of other countries, and for the protection of our shores, and our trade and commerce. So it is suggested by Mr. Carpenter that, if the foreigner requires of our natural and national resources, the foreigner may as well contribute to the support of our Navy, which his very existence renders necessary. The proceeds of the tax would be welcome in this connection; it would also be useful in other directions. The coal owner himself has likewise pointed out to him a road by which, despite the placing of a tax on raw coal, he too may derive some advantage. Much of the coal that is sent abroad is used to obtain metallurgical coke; and the countries so employing our coal use the gas, and have the advantage of the bye-products, including the motor spirit for which every country, ours included, is asking. Now, inquires Mr. Carpenter, why should not this country benefit from keeping the coking of this coal at home, the residuals, and the motor spirit, and then exporting the coke? If it would work out in this way—if the foreigner would purchase from us the metallurgical coke he needs—well and good; but naturally the coal owners would ask, "What guarantee have we that the "foreigner would take the metallurgical coke?" We are afraid they would not, and that they would consider that the greater space occupied by a ton of coke than of coal in the hold of a vessel could be more profitably occupied for their purposes by the raw material. The picture, however, is a nice one, though there is a good deal that is problematical in its composition. We can quite see the coal owner preferring a large clear profit from his raw material, free from the encumbrances of additional capital expenditure and extra labour and a speculative future, than adopt something that might have a large amount of uncertainty about it. However, there it is. The coal owners may have already looked into the question of the alternative—the coking of coal, rather than its sale abroad. On the other hand, they may not have given the matter serious consideration; and perhaps it would be worth while their doing so. But overriding all else is the fact that it is grossly unfair to this country that the demands of others for British coals should act injuriously on home consumers and home industries—enriching comparatively few, and doing injury to a perfect host.

There is satisfaction in the fresh evidence that Mr. Carpenter brings forward as to an easing of prices in respect of coming coal contracts. The conditions are all symptomatic of this. Early coal contracts are made for the Continent—earlier than at home; and Mr. Carpenter understands that Paris and certain other Continental cities have entered into contracts for British coal at a reduction of 2s. 6d. per ton. If it were not for the indications, many gas undertakings would, with the residuals markets as they are, have no alternative but to raise the price of gas—the South Metropolitan Company among them. We hope that nothing of the kind will be necessary; but it now all depends on coal. There is nothing in the conditions of coal production, and a fair profit upon the coal, to justify the exorbitant prices of recent times; and it is to be hoped the gas industry is now to have an opportunity of rehabilitating itself, and, by the sale of gas at lower prices, to extend its custom

with the coal-fields. Certain is it that the change in the gas industry's fortune, expanding as is its business, cannot commence in the current half year. But next half year, it is hoped, will see the then prevailing conditions brightened by relief from excessive coal prices.

In their district, the South Metropolitan Gas Company are doing remarkable things in connection with the work of maintaining their lighting load; and the lighting load is something that no effort should be spared to maintain. The use of gas for lighting is subject only to the hours of light and darkness, the alternations of which are seasonally as nearly regular as they can possibly be. Cooking is another good ordinate load; but domestic heating is subject to the vacillating temperatures of our climate. This being so, Mr. Carpenter urges that everything possible shall be done to make gas lighting as nearly perfect as it can be under its endowments by Nature. They have in the South Metropolitan Company worked hard to make it so; and how is fairly generally known, though anyone without the information will find it set out in the speech at the meeting of the proprietors. The Company have sought to create a taste for more decorative fittings, have met the requirement for a new burner that involves little labour on the part of the consumer—a burner, too, that keeps cool and undiscoloured the metal work of the fitting above. They have done this; and the ambition of the Chairman and Board and their technical staff is now to supply a gas that, in its combustion, will give off products that will be even less harmful than the exhalations of human beings. With the nickel process of purification, the Company are in the way of accomplishing this; so that only pure carbon dioxide (and not carbon dioxide charged with organic matter exhaled by human lungs) and water vapour will be the simple products of combustion. Supplementing these conditions in the maintaining of atmospheric purity are the ventilating and sterilizing attributes of the gas-burner. This subject of lighting, and others referring to the coke market, to the many thousands of tons of coke sent out in 28-lb. bags during the recent coal porters' strike, to the Company's accident fund, and to co-partnership, made up a speech that is one of the best of the several excellent ones that have been heard from the chair of the South Metropolitan Company.

Wanted, an Educational Scheme.

What was at once an attack on a deficiency in the gas industry, and an appeal for the remedying of the deficiency, was made by Mr. F. J. Bywater, in an address he delivered last Saturday evening to the members and guests of the Midland Junior Association at their annual dinner. From no one, perhaps, could the criticism and the appeal have fallen with greater propriety; for Mr. Bywater supplies a link that closely connects the juniors of the gas industry with the men of front professional rank. But a few years ago, he was the first President of the Midland Junior Gas Association—"my junior days are not very far behind me" he said in one part of his address—to-day, he is the Engineer of the vast East Greenwich works of the South Metropolitan Gas Company. Therefore he can to-day make a close inspection of things from the points of view of both the junior and the responsible engineer; and the thoughtful seriousness with which he has delivered himself on a subject that has come under his critical observation will command—and we feel it a duty to assist in ensuring that it will command—the grave consideration of those who can move in the matter against which he lays complaint, and which he seeks to redress. Certain are we that the address cannot go unheeded; and just as certain are we that the morrow will find Mr. Bywater with strong supporters to the claim that he makes not only on behalf of the juniors, but on behalf of the future of the industry.

There has been a continuous torrent of talk on the subject of technical education in connection with all industries. Much has been said as to the requirements in connection with the gas industry; many of the old deficiencies have been removed; opportunities have expanded; and yet, for the major part of those who aspire to technical and managerial rank in the industry, there still exists a notable want. This want is a real educational system—a definite system on which the education of the technical juniors of the industry can proceed; a system that will be directive and efficacious in assisting the earnest junior to know what he should do to make himself proficient and competent with the highest of all motives—to ensure that his qualifications shall be of the utmost value to the work of the undertaking to which he devotes himself, and therefore to the industry at large. We are not believers in any cast-iron rules being applied to the cultivation of intellects that are as varied as the faces we see about us. But in connection with the gas industry, as with other industries, there is certain fundamental and practical knowledge that must be the possession of every man who is undergoing preparation for technical office, and the assimilation of which knowledge can be in a very considerable measure brought into a defined course.

What also is important to remember is that the claim for some systematic line of study and preparation is stronger in an industry such as that of gas supply than in most others, in view of the diversity of qualification that is demanded. There are, indeed, few men who combine in themselves all things that the gas industry requires in a chief; but it is every man's duty both to himself and to the industry to get as close to requirements as he possibly can. The chief of a gas undertaking of any pretensions to-day should be a real engineer (constructive and mechanical), a chemist, a good administrator, manager, and commercial man; he must know the best means of applying and utilizing his primary and secondary commodities; electrical knowledge is now a requisite in many gas-works; and there must be an intimate acquaintance with the competitors of town gas and certain of the residuals. Yet, realizing all this, the industry continues without any guiding scheme of education for those who are preparing to do its multiplex and complex technical and commercial work. Here is the complaint Mr. Bywater prefers, and the attack he makes upon a deficiency that has been allowed to exist up to the present. Deliberate judgment is found in the words: "I think it is of vital import-" ance that this great want should be remedied at once. It " is no use disguising the fact that, while the gas industry " to-day occupies a position of magnificent strength, it is " certain that the future will not only produce many claims " for development and improvement from within, but also " many assaults on its position from without; and it be-" hoves us to take care that the young men who are coming " into it daily go into the fight well-trained and well-" educated."

Mr. Bywater is anxious he shall not be misunderstood. Pointing to the existence of the deficiency of which he complains is not by any means a criticism of, or censure upon, the Leeds and Manchester Universities, the Imperial College of Science, or the excellent technical colleges that exist. These are all places where the fundamental training of gas students can take place; and those who are fortunate enough to be in the position to commence their training at such seats of learning are those who will also, in all probability, subsequently have the good fortune to be articled to a first-class chief engineer, who will see that his pupil's practical training follows the correct lines. The gas industry, however, is not for the privileged few. It is for brains and ability, irrespective of the social position of those in whom reside the essentials to the very best work. Mr. Bywater's solicitude is for those who, through the accident of birth, are left largely to follow their own devices as to the course of education they shall pursue, and who, looking for guidance at the present time, find before them almost a blank—at any rate, chaos and uncertainty. The frequent result of pursuing their own inclinations is much waste—a smattering of this, and a smattering of that, but nothing solid, orderly, and of the highest value. This is a pity—a pity alike for those who aspire, and for the industry. There is room here for the introduction of a scheme, and, in a measure, for co-ordinating primary instruction, on lines laid down by those in the industry qualified to undertake the task of formulation. The fulfilment of such a suggestion would be useful not only to the aspirants to technical position and to the gas industry, but it would be helpful to technical colleges and schools as a basis for arranging a curriculum suited to gas-engineering students. At the present time, we know there prevail the most hazy notions as to what is educationally required in our special branch of engineering. Even among those who are teachers of gas engineering and application, there exist widely varying ideas as to what are the best lines to pursue; and the same may be said of gas engineers to whom candidates for technical position are articled. The methods of training followed—"training" is not always the correct word—show a wonderful divergency, which cannot altogether be attributed to any consideration for the mental bent, aptitude, or otherwise of the pupils. A flexible scheme

passing beyond the preliminary educational stage to the practical training would, we are quite convinced, be useful in more ways than one.

The time is fully ripe for undertaking what Mr. Bywater asks, instead of allowing matters to drift as now. We have the first essential in the gas industry—young men possessed of both enthusiasm and keenness. The address awards that possession as a second essential; we give it the capital place. The second essential (which is placed first in the address) is that technical colleges and schools exist in the larger centres; but save in two or three instances, there is in them a very inadequate appreciation as to what course of study the gas student requires. The third essential is missing—the programme or scheme of education, based upon the knowledge and experience of representative men in the industry. How to get this scheme is the question. Confidence there is that we shall quickly hear of a large concurrence with Mr. Bywater's views, and a ready willingness to help in the project. There is no doubt, too, as to the expression on behalf of the juniors of an immediate desire for the project to materialize. It is not an impossible thing that is asked; it is not a great thing. From it, however, great things may arise. No better way can there be for attaining it than for a joint representation on the part of the junior organizations to the Institution of Gas Engineers, asking them to appoint a Committee for the purpose of considering and formulating such a progressive scheme of education as is portrayed as desirable in the address. Careful deliberation will, of course, be required. It is not a matter, if it is to be well done, that can be brought to beneficial accomplishment in a rush; but the collaboration of senior engineers with juniors who have lately passed through the mill should have good result.

It is unnecessary to speak of the advantages of such a scheme—the advantage to the student in giving him something to work to and for; the guiding advantage to the technical school and the gas engineer with pupils; and the large advantage to the gas industry. Only this last week we have heard that one great Railway Company has found it necessary to go to America for the right man to undertake its general management. We are not in a position to say that the censure on this country and the British railway world, that there is in the act, is deserved; but we are prepared to say that it is a serious reflection upon the Railway Company that acknowledges its own omission to make proper provision for a man to take its chief executive position when the time came without having to go abroad for one. The British gas industry does not want at any time to have to make similar confession. It must be able, under any conditions that may arise, to supply its own properly trained men. Moreover, we want to see the British gas industry the training-ground for men required in distant places over the seas. We desire to see it develop men capable of taking, in all respects, top places, without it being a supreme difficulty to find the right man with the requisite multifold qualifications for the highest positions. The gas industry has a large part to take in the world's work and affairs; and it will be still larger. What is necessary is that our men everywhere shall be equal to making that part as full, as potent, and as fruitful as it can be. One way to accomplish this is by following up the suggestion that has fallen from Mr. Bywater.

The "Lancet's" Simple Test for Gas-Fires.

It gives us pleasure to draw attention to the valuable method of testing the sufficiency of the ventilation of gas-fires which has emanated from the "Lancet" laboratory, of which Mr. S. A. Vasey is the Director. A description of the method, which we are told had for its inspiration the principle adopted in the now well-known "Shadowgraph" test, was quoted in last week's "Journal" (p. 354) from the pages of the "Lancet." The new method, like the "Shadowgraph" test, depends on the detection of any products of combustion which may be escaping in front of a gas-fire by the expedient of rendering visible some constituent of those products. In the "Shadowgraph" test it is the water vapour which naturally results from the combustion of gas which is rendered visible by condensation. In the "Lancet" test, a trace of the vapour of some highly volatile chlorine compound is added to the primary air supply of the atmospheric or bunsen burner of the fire; and this vapour, in passing through the hot burner and flame, is decomposed, and the chlorine combines with hydrogen to form hydrochloric acid. The latter therefore appears among the products of combustion, and even minute traces of hydrochloric acid in air form a dense white cloud of ammonium chloride when they come in contact with ammonia. If, therefore, products of combustion are escaping in front of a gas-fire, to the air supply of which a trace of the vapour of some highly volatile chlorine compound has been added, the escape may be readily detected by the appearance of white fumes of ammonium chloride when a source of ammonia gas is passed along the edge of the canopy. The source of ammonia gas may be either a piece of sponge soaked in ammonia solution, and fixed on the end of a wire, or a small open bottle or test tube containing a little of the solution can be used.

Such in brief is the "Lancet" test, of which we have made a cursory trial with results which must be considered quite satisfactory, since the indications have tallied with those of the "Shadowgraph" test. In many respects, the test is an advance on the latter. It is readily applicable to all gas-fires in which the air-inlet to the bunsen mixing-tube is accessible—*i.e.*, to practically all British-made gas-fires of modern construction; and it requires no special adaptation or fitting for the particular fire. Moreover, it may be applied to a fire after it has been fixed, whatever may be its position, and its surroundings in the room; and thus it makes it possible to ascertain readily not merely if the ventilation of a particular type of fire is in general adequate, but also if the ventilation is sufficient for the actual conditions in which the fire is to be used. In this way, the test should become very useful in determining the extent to which flue-pipe or other draught inducer is required to supplement the natural ventilation of the fire, when the latter has to discharge its flue gases into a chimney which is prone to give a down-draught. In ease of application in such circumstances, it seems superior to the "Shadowgraph" test. We have consistently held that the latter test has been invaluable to the gas industry in promoting hygienic gas-fire construction, from which ultimately both the industry and the public must derive great benefit. That another test which is in many respects more convenient has been devised in no way detracts from the merits of the "Shadowgraph," the principle of which was original, and has furnished the inspiration for the latter test.

The volatile chlorine compound which is best adapted for general adoption in applying the "Lancet" test is carbon tetrachloride, which may be safely put into the hands of anyone who will be called upon to test the ventilation of a gas-fire. Chloroform would answer equally well, but it is less suitable for general use; and there are other volatile chlorine compounds which could be employed, but which are less readily obtainable and less innocuous than carbon tetrachloride. According to the "Lancet" account of the test, a chalk pencil, a pyramid, or an absorbent disc soaked in carbon tetrachloride is placed near the air-inlet to the mixing-tube. In the trial of the test which we made with materials at hand, a small piece of sheepskin was used to absorb some carbon tetrachloride; and this, when placed below the air-inlet, served its purpose admirably. Possibly the most convenient arrangement for general use would be to fill the reservoir of a small spirit-lamp with carbon tetrachloride, and let the wick carry up the liquid, and allow it to volatilize close to the air-inlet. A flat-bottomed shallow metal reservoir, with a wick-tube, and a well-fitting screw cap to prevent evaporation and spilling when not in use, seems likely to be the handiest equipment for the gas inspector, provided such a "lamp" proves on trial to impart about the desired proportion of vapour to the ingoing air when it is placed below or alongside the air-inlet of the mixing-tube of the fire.

In conclusion, we hope the "Lancet" will permit us to congratulate its laboratory staff on having devised this simple and valuable test for the sufficiency of gas-fire ventilation. Its application will undoubtedly in the long run be of great service to the gas industry, though it is likely, in the first instance, to lead to the scrapping of some gas-fires of obsolete and unhygienic types which might otherwise have continued in use for some years to come. But the good repute of gas for domestic heating will become yet more firmly established as soon as these fires are replaced by others conforming with the present hygienic standard. Having had occasion, at times, to differ from the "Lancet" on another phase of gas supply in relation to public hygiene, we are glad to take this opportunity of expressing our hearty appreciation of the value of the test for gas-fires which it has now presented to the public.

Discs and Prepayment Meters.

THE case at the Manchester Sessions in which a woman was charged with having obtained credit by means of fraud other than false pretences, by securing gas through a prepayment meter by using discs in lieu of pennies, has ended in a manner that is very unsatisfactory to gas undertakings generally. This is the case referred to in the "JOURNAL" for Feb 3 (pp. 276, 299). The Manchester Gas Department had no desire to be harsh on this particular woman; but it was felt to be a duty to put a stop to the abuse of the convenience that the prepayment meter is to the poorer section of the community by taking proceedings against her —she having been repeatedly warned regarding the practice, and having as often promised that it should not occur again. The threats of the Gas Department appear to have no terrors for her; and to-day she is no doubt entertaining a very high opinion of the law and of those who administer it, and practise in its Courts. The hearing at the sessions sees the woman scot-free, and the legal authorities of the Corporation considering the enigma with which the case has presented them. The woman was first charged under the Larceny Act. This would not do; and so the case was brought under the Debtors' Act of 1869. Now the Recorder has held that, while there are several ways of stopping offences of this kind, the section of the Act under which the proceedings were taken does not apply, and the Jury were directed to find the woman not guilty, although the discs in her meter-box show that she had not pursued the orthodox way of obtaining gas by prepayment. It is a good thing that the Recorder made the remark as to there being several ways of stopping offences of this kind, as otherwise the result of the decision might have been that people would have considered that they could with impunity use discs, instead of making *pre*-payment under their contracts.

One point that appeared to nonplus the Recorder was as to when, in the circumstances, credit started. While the legal representative of the Corporation held that credit commenced with the beginning of the use of the supply of gas that was obtained by the aid of a disc, the Recorder was inclined to consider it actually began from the time when the collector called to take possession of the money, and when adjustment was ordinarily made between the money in the meter-box and the registration of the meter. It was acknowledged that, if more money was put into the money-box than the registration of the meter indicated ought to be there, it was returned to the consumer; while if there was a shortage of money (owing to some defect in the meter), as indicated by the registration of the index, then an account was sent to the consumer for the balance. Therefore the placing of a penny in the slot of a meter does not admit the final liability of the consumer. The Recorder found it difficult to say that legally any credit by fraud had been obtained; but, to the mind of the ordinary individual, there will not be much doubt as to the obtaining of credit in a manner that is altogether against the fundamental principles of the system. The use of discs is not prepayment; it is not a use contemplated by the meter or the system; and it certainly is not in accordance with the terms of the prepayment agreements, which make it a condition precedent to obtaining a supply of gas that a penny (or other coin for which the meter is designed) shall be placed in the slot. The decision, however, does not acquit the woman of wrong-doing; it only says the legal representatives of the Corporation had not, in the opinion of the Recorder, settled on the correct section of the statute under which to proceed.

There is another important point about this case, which is not a legal one, but only a question of design. We have had an opportunity of examining some of the discs used by this woman. They are merely cut out of what may have been a child's tin toy engine, or a box such as a small quantity of tobacco is sold in. Some of the discs are cut to the size of pennies; others are as small as halfpennies; and no less than seven of them are required to equal the weight of a well-worn penny. It is a pity that weight as well as size is not a factor in connection with the article—in the present instance, the penny, to be legitimate—that sets in operation the mechanism of the meter; and it is likewise a pity that there are meters that can be set in operation by discs much smaller than the coin for which they are constructed. Something should be done to prevent this; and it would be advisable, if possible, if weight, allowing a margin for the wear and tear of pence, could also be made to constitute a protective factor in new constructions. If the meter in question had required for its operation a disc approximating in size and weight to a penny, this woman would probably not have been brought before the Magistrates and the sessions. The manufacture of discs such as she used is so simply and promptly accomplished that it supplies a temptation to people of her class; and it is the business of the gas industry to see that easy roads for wrong-doing of this kind do not exist in the appliances by and through which it invites the custom of the poorest section of the community.

Alkali Manufacturers Redivivus.

The Alkali Manufacturers' Association—an organization about which little is known outside itself—has not been seen or heard of in the Committee Rooms at Westminster since the Joint Committee of both Houses of Parliament came to the conclusion that there was no reason for inhibiting free trading in residual products in the gas industry, as sought, for personal motives, by the chemical manufacturers in the session of 1912. But these gentlemen threaten to once more show themselves in the committee rooms, if there is any meaning in the petition that they have lodged against the South Suburban Gas Bill. The South Suburban Company were one of those that, through error, had their hands tied in 1912, at the instance of the chemical manufacturers, in the matter of residuals dealings; and in the Bill which they are promoting in the current session, they are asking to be liberated in accordance with the findings of the Joint Committee. The chemical manufacturers apparently object to losing even one of the victories scored by them before the thorough inquiry into the matter divulged the subtlety and possible effects of their movement; and so evidently they are going to try to induce Parliament now to go back on the decision of the Joint Committee. They seem to be fond of wasting time and money. Perhaps they are encouraged in this by the form of the general purposes clause in the Model Bill this session. We rather think, however, that Select Committees will not ignore the work and judgment of the Joint Committee. Certainly the Chairman of the South Suburban Company (Mr. Charles Hunt) and his colleagues are not going to be induced by the lodging of the chemical manufacturers' petition to withdraw the repealing clause, particularly as the Board have always felt that the clause was imposed before anyone actually knew what was taking place and what was meant, and before there had been a complete inquiry. A list of the petitions against Gas and Water Bills, so far as they have as yet been officially recorded, appears in our "Parliamentary Intelligence." But the lodging of petitions is no indication as to more serious opposition. Many petitions are pure formalities for protection, or to open the way to bargaining for concessions.

Some Notable Points.

There are some notable points to be extracted from the speech of Mr. Charles Hunt, in addressing the proprietors of the South Suburban Gas Company last Friday. There is already on record quite a mass of information as to the effects of high coal prices and lower market values for residuals; but Mr. Hunt graphically showed what these changes have meant by total and average figures. For example, he mentioned that the price of coal and the lessened values of residuals had caused the cost of gas-making to the Company to be increased by 5¾d. per 1000 cubic feet, compared with two years ago—practically 6d. No comment is needful to emphasize the seriousness of this. Another point is that, although it is so recently that the West Kent Gas Company was amalgamated with the South Suburban Company, the consumption of gas in that area has nearly doubled. This suggests that there had been stagnation in the district before the annexation took place, and that the residents appreciate the new order of things, and the new methods of business-getting. In connection with the recent cold weather, the Company experienced increases in consumption of from 8 to 17 per cent. compared with the corresponding days of last year; and this indicates the important part now taken in the business by domestic gas heating. There is here a hint that may be useful to other concerns. It is that the Company find it very beneficial to offer the inducement of free fixing during summer months of gas-fires, and to make the rental charge only apply to the winter quarters, and not to the summer. This relieves the pressure of the fitters' work during winter, and provides extra employment for the hands during summer.

An Excellent Site.

At the meeting the proprietors approved of the promotion of the Bill deposited in Parliament, which, among other things, is to

authorize the purchase of 189 acres of land at Belvedere, with river frontage and railway communication. Part of the land it is proposed to devote as a "factory area" (we surmise that the Chairman's experience at the Garden City at Letchworth has kindled this idea), to which manufacturers are to be invited, with provision by the Company, if Parliament consents, of cheap supplies of gas and electricity. The Local Authority cannot object to this part of the Company's scheme, as if in due season it matures through the facilities offered, large factories on the site would add to the rateable value of the district.

The Consolidated Gas Company's New Building.

In another part of the "JOURNAL" will be found some structural details of the gigantic building which has been erected by the Consolidated Gas Company of New York for the carrying-on of their business. The references to it which have appeared from to time in our columns have been sufficient to indicate that when completed it would be something altogether out of the ordinary way; and this is borne out by the particulars and illustrations we are able to present, thanks to the courtesy of the official of the Company—Mr. Herbert W. Alrich—to whom was entrusted the preparation of the designs for the foundations and the structural steelwork. The erection of the building has been a remarkable achievement, as will be acknowledged by all who read the details given. It amounted to suspending a seven-storey building over one of twelve storeys, situated between two others rising to nineteen storeys. The work has been referred to by engineering periodicals in America as "constructing a building upside down." While New York City contains many buildings notable for their height, their architecture, or other obvious reasons, this one is remarkable because of the fact that, though it includes in its construction some extraordinary engineering features, they are now non-apparent in the completed structure; that is to say, it is notable for the reason that the unique features referred to are not obvious.

Precautions for Transmission Machinery.

To those in charge of works in which belts and shafting are employed may be commended an excellent report on "Fencing and Safety Precautions for Transmission Machinery," by Mr. W. Sydney Smith, H.M. Inspector for Dangerous Trades. This has been presented to the Home Office by Sir Arthur Whitelegge, M.D., Chief Inspector of Factories, who remarks that it is intended to explain, with regard to the several parts of transmission machinery, the structural and administrative safeguards which the experience of the Department shows to be needed for the protection of persons employed. Certain of them are not adequately covered by the existing law; and it is proposed that the more important requirements should be embodied in regulations to be made in accordance with the provisions of the Factory and Workshop Act of 1901. Rightly, however, it has been determined to defer the formal issue of regulations until those concerned have had time to consider the proposals and to submit any observations they may desire to offer. The expression "transmission machinery" is intended to cover the whole of the mechanical appliances which serve as connecting-links for transmitting the motion of the prime mover to an individual machine. The term which is used in the Factory Acts is "mill-gearing;" and this is defined as comprehending every shaft, whether upright, oblique, or horizontal, and every wheel, drum, or pulley, or other appliance by which the motion of the first moving power is communicated to any machine appertaining to a manufacturing process. The former term, which is adopted for the purposes of the report, is regarded as being somewhat wider in application than "mill-gearing;" but "transmission machinery" does not include the shafts, pulleys, wheels, and belts forming part of the mechanism of an individual machine. These are not dealt with in the report.

Accident Prevention.

As a justification for action, it is pointed out that, in spite of the introduction of improved methods, and the requirements of the Factory Acts, the number of reported accidents due to mill-gearing is still very large. In the past six years there has been practically no decrease in the number of fatalities, though the value of this observation for comparative purposes is lessened when it is pointed out that there is no available information regarding the increase in this time in the number and extent of installations of mill-gearing. A glance through the report shows how many accidents have occurred which might have been prevented either by the exercise of greater care on the part of employees or the provision of more adequate safeguards in connection with moving parts of machinery. Mr. Smith suggests many things which might be done to prevent accidents; and it is these recommendations which, embodied as an appendix, form the proposed code of new regulations. The addition of over sixty illustrations renders the various suggestions made quite easy to understand.

PERSONAL.

Mr. WILLIAM THOMPSON, of Shrewsbury, has been appointed Water Engineer to the Bridlington Corporation.

Mr. H. HURD, the Surveyor to the Broadstairs and St. Peter's (Kent) Urban District Council, has been appointed Water-Works Engineer.

At the annual general meeting, on the 4th inst., of the Society of Public Analysts, Dr. RUDOLF LESSING was elected one of the two Honorary Secretaries; and Mr. J. H. COSTE was appointed as one of the new Members of Council.

Mr. J. H. WILLOUGHBY has been appointed Manager and Secretary of the Ogley Hay and Brownhills Gas Company, near Walsall, in place of Mr. Henry Shepherd. Mr. Willoughby was formerly with Mr. Berridge at Leamington.

Last Thursday, Alderman W. A. SCHULTZ, J.P., and Mrs. Schultz, who last year filled the office of Mayor and Mayoress of Deptford, were entertained at dinner at the Trocadero Restaurant, and were presented with a handsome silver fruit-stand bearing the following inscription: "Presented to Alderman W. A. Schultz, J.P., and Mrs. Schultz, by the Mayor, Aldermen, and Councillors of the Borough of Deptford, and other friends, in recognition of the valuable services rendered by them as Mayor and Mayoress of the borough, 1912-13." The Mayor (Mr. W. F. Marchant, J.P.), with some appreciative remarks, handed the fruit-stand to Mrs. Schultz; and to Alderman Schultz he presented an amber and gold cigar holder in a silver case.

A second West Bromwich Corporation Gas Engineer is to enter the service of the British Gaslight Company, Limited. The first was Mr. Thomas Glover, who went thence to Norwich in the year 1901. Now Mr. HAROLD E. COPP (who, after filling the position of Assistant Engineer of the Stockport Corporation Gas-Works, succeeded Mr. Glover at West Bromwich) has, we are pleased to learn, been appointed Engineer and Manager of the Staffordshire Potteries Station of the British Gaslight Company—a post which has become vacant through the retirement of Mr. John R. Heath. Mr. Copp (who was President of the Midland Association of Gas Managers in 1908, and for four years subsequently acted as Hon. Secretary) read a paper on "Incandescent Gas Lighting, with Special Reference to Inverted Burners," at the Dublin meeting of the Institution of Gas Engineers a few years ago. He served his articles with Mr. Fletcher W. Stevenson, who was at that time Engineer to the Sheffield United Gas Company; and afterwards he was engaged by the Company as an engineering assistant, being for some time in charge of the new works at Grimesthorpe. It was in 1895 that he went to Stockport.

OBITUARY.

At the last meeting of the Stalybridge Town Council, the Mayor (Alderman J. Bottomley) referred in sympathetic terms to the death of Councillor J. RIDYARD, J.P., who had been a member of the Council for 36 years. For about 21 years he had been Chairman of the Finance Committee, and took a prominent part in the purchase by the borough of the then Stalybridge and Mossley Gas Company. Mr. Ridyard acted on the Water Committee for over thirty years, and was thrice Mayor of the borough.

In another column to-day some account is given of the lifework of one who was well known as a contractor for gas-works residuals; and we have here to notice the death of a gentleman who was years ago connected with the outside fitting and public lighting work of the Gas Light and Coke Company—before so much of this branch of the business was undertaken, as at the present time, by those who are directly in the employ of the organization having its headquarters in the Horseferry Road. Mr. THOMAS A. GREENE—who died suddenly last Friday, at his residence at Streatham, aged 76—was son of the head of the now extinct business of Henry Greene and Son, of No. 155, Cannon Street. Mr. Greene had for many years retired altogether from business. He, however, to the last kept up his connection with gas companies as a considerable shareholder; and he was also well known to many in the profession as one of the founders of the Evening Star Lodge, No. 1719. He was W.M. of the lodge as far back as the year 1881, and was some years since elected an honorary

member of the lodge. He was a fairly frequent attendant at the meetings—more so than the only other honorary member, Mr. J. Walter Sugg, who died as recently as Jan. 21. The funeral is fixed to take place at Norwood Cemetery to-day (Tuesday).

We regret to announce the death of Mr. JOHN COATES, M.Inst.C.E., founder and Chairman of the firm of John Coates and Co., Limited, for many years in Suffolk House, City, and now of No. 115, Victoria Street, S.W., which took place at the residence of his daughter, Mrs. Peacock, at No. 10, Hay Hill, Berkeley Square, W., on Feb. 10. He was born in 1846, educated at Newcastle-on-Tyne, and received his engineering training at Lord Armstrong's Elswick works. At an early age, he joined the well-known firm of Thomas Hawksley and Co., Gas and Water Engineers, of London. Some years later he commenced business in the City of London on his own account, and represented as agent many leading engineering firms; among them being the late Messrs. John Abbot and Co., Limited, of Gateshead-on-Tyne, and R. Dempster and Sons, of Elland. As soon as his London business was firmly established, Mr. Coates visited Australia. He resided in Melbourne for many years, and opened a branch office there, from which he conducted the installation of the Melbourne Hydraulic Power Company, the Sydney Hydraulic Power Company, the Colonial Gas Association, and other important works. He was well known in engineering circles, and held in high esteem by all with whom he associated in Melbourne. Mr. Coates next turned his attention to Canada, and opened a branch office in Ottawa, and devoted some years to installing gas-works in many Canadian towns. He was President of the Ottawa Gas Company, the Ottawa Board of Trade, and the Conservative Association. He resided in Ottawa for sixteen years; and during this period he occupied many important positions in the business, political, and social life of the city; having also served the citizens as alderman for several years. Mr. Coates had many friends in Canada, and was a member of the Canada Club, and several other well-known clubs. He was a brother of the late Mr. Thomas Coates (Manager of the Whessoe Foundry Company), whose death occurred in April of last year.

THE LATE ALDERMAN HOWLETT.

IN the course of his remarks at the meeting of the South Metropolitan Gas Company on Wednesday last, sympathetic reference was made by the Chairman (Mr. Charles Carpenter, D.Sc.) to the death of Alderman George Howlett, which took place on Christmas Eve, as the result of an apoplectic seizure. The sad event called for notice by the Chairman from the fact that the deceased was the Company's principal coke contractor. But, apart from his association with the Company, he occupied a conspicuous position in the public life of Lambeth—a position he had attained through perseverance and the exercise of his abilities on behalf of his fellow-men. A few particulars of his somewhat remarkable career, culled from the full and appreciative notices which appeared at the time in the "South London Press," may not be without interest.

Mr. Howlett was born in 1842, and began to work at the early age of ten. Having, by much self denial, saved a little money, he purchased a horse and cart, bought coke at local gas-works, and sold it in the streets. When he found a buyer, he shouldered the sacks, and shot their contents into the cellars. From this small beginning the business grew apace; and in course of time Mr. Howlett became the principal coke contractor to the South Metropolitan Gas Company. Many years ago he took his sons, George and William, into partnership; and now the firm has a reputation second to none in the trade.

Outside his business, Mr. Howlett was engaged in public work in Lambeth which was so far-reaching as to cause his death to be generally felt as an irreparable loss. Perhaps the greatest service he rendered was in connection with poor law work. He was first elected a member of the Board of Guardians in 1883, and was Chairman from 1886 to 1888. He was absent for a year; but in 1890 he was appointed Vice-Chairman, and from 1891 to 1907 was Chairman. He thus occupied this position for twenty years. After this he served on the Board, and took a large share of the work of the various Committees. Speaking at a special meeting of the Guardians held to pass a vote of sympathy with the relatives of the deceased, the Chairman (Mr. Frank Briant) said Mr. Howlett had "left behind him a heritage by which Lambeth would benefit for years to come." He was elected a member of the old Lambeth Vestry many years ago, and subsequently served upon the Borough Council. He was a member of the Progressive Party; and when they were defeated in 1909 he was promptly elected to an aldermanic seat. The Mayor (Alderman Jabez Williams) recently recorded his tribute to the "unselfish, self-sacrificing work" done by his late colleague.

A lifelong abstainer, Alderman Howlett in his early days took a prominent part in the temperance crusade which was waged in the Metropolis thirty or forty years ago. Of late, however, though steadfast in his principles, he figured less frequently upon the temperance platform, as he regarded the work as having been to a large extent completed. Quite early in life he began to acquire house property; and at the time of his death he owned about 200 houses, mostly of the cottage type, in Lambeth, Battersea, and Wandsworth. As a landlord he was exceedingly popular with his tenants; and they, with many others, greatly mourn his loss.

ELECTRICITY SUPPLY MEMORANDA.

THE electrical people are recognizing the advantage of getting electric cooking apparatus into schools where cookery forms the whole or part of the curriculum. The London County Council have now introduced electric-cookers into some of their elementary schools; and through the interest taken in the matter by certain people concerned in electricity, a cooker has lately been installed among the equipment at the National School of Cookery. There is no objection to all this. The sooner the actual facts as to electric-cookers are disclosed by experience, the better; for experience has a happy knack of removing the figments of the electrical cookery exponents. There are only two references we wish to make to a report that has appeared in the "Electrical Times" on the introduction of the electric-cooker at the National School of Cookery. The writer says that he observed with surprise that some gas hot-plates there were heated, not by bunsen rings, but by flat-flame burners mounted inside metal rings. "The explanation seems to be," he adds, "that, with so many cookers in operation, the students would be overpowered by the fumes from the atmospheric burners." Someone has been "pulling the leg" of that writer. He sadly wants a little chemical instruction, so as to keep his pen from slipping, and to prevent the disclosure of his own deficiencies of knowledge upon the subject. In the use of luminous flames, the National School of Cookery is an exception among all other schools of cookery, where the students are not overpowered by "fumes." The use of luminous flames for heating of any kind is archaic; but it is quite a tradition at the N.S.C. The same writer, addressing nobody in particular, asks whether it is too much to hope that eventually the whole equipment at the school will be changed over to electrical operation. We should think it is.

In the Schools.

One of the failings of electric cooking advocates is to quote below the actual consumption of current for domestic operations; but the facts gradually leak out. Mr. John Roberts, of Durban (Natal), writing, near the end of last year, to the contemporary mentioned in the preceding paragraph, stated "that the electric-cooker of English manufacture was unsuited to South African conditions." The "Electrical Times" capped this by stating that the electric-cooker is equally unsuited for the majority of English households; and with this the majority of English households agree. Since then, Mr. Roberts, in a report, says that, from personal observation, he is able to put the consumption of electricity for cooking for an average household at 15 to 20 units; while a household of two would find a daily consumption of 10 units ample. If the household could put up with *cold* meats *frequently*, a less amount of current would suffice. We can surmount that sage remark by saying that, if the household could do without cooking entirely, the consumption of current would be still less. An account has recently come to hand of a fresh experience of electric cooking in a household. Some of our readers have seen the fuller details, and know the source whence they reach us. There were two in family; and a small servant was kept. The wife did the cooking. Instructions were received by the gas suppliers to remove the gas-cooker, in favour of an electric one, the energy for which was to be charged at 1d. per unit. The running cost of the gas-cooker had averaged 2s. 10d. per week, and no repairs appear to have been called for. The electrical people said electric cooking would not cost more. The actual cost averaged for this small family 5s. 3d. per week for electricity, *plus* the cost of obtaining by heating by coal the hot water required. Complaint was made to the electrical people; and a lady demonstrator was sent to show how it ought to be done. But things did not improve under her expert instruction. At their wits' end, the electricity purveyors offered to let the householder have his current for cooking at 2s. 10d. per week—the same as his gas bill had been. If 1d. per unit was the correct charge, then 2s. 10d. per week was not correct. It was next suggested that the current should be charged for at the rate of ¾d. The householder accepted; but it also turned out that during this short experience, a man had to be sent seven times by the makers of the electric-cooker to effect repairs, for which repairs the electrical people paid, and promised, moreover, in order to mitigate the discontent, that they would keep the cooker (which cost £17) in order for two years. The householder (who had also had to pay £7 for the wiring and installation) was partially mollified, and consented to keep the cooker. The next incident was that the whole of the hot-plate went wrong; and, exasperated beyond measure, the householder ordered a gas-cooker of modern form to be fixed. During the time the electric-cooker was in use, the expenses for cooking (without calculating the cost of the cooker and installation) averaged in the summer months 7s. per week; and in the winter the householder considered 5s. 3d. was a fair average to take, seeing that the coal range was necessary for warming the kitchen, and so provided hot water simultaneously. Relieved of all uncomfortable trouble, the whole cost of cooking and water heating for the kitchen is, with the new gas-cooker, so much less than with the electric-cooker that the extra wages required for a servant who is a competent cook is paid out of the saving, and the householder is still money in pocket. There is

Electrical Imposture.

no fiction about this. Yet the same householder was told that his expensively purchased electric-cooker would cost him no more in operation than his gas-cooker. Experience has now disclosed the imposture.

Wanted Shock-Proof Cookers and Grills.

There is at least one thing for which the "Electrical Times" deserves credit in connection with this cooking and heating business; and that is for the campaign it is conducting in its "Cooking and Heating Notes," against defective construction. "Safety above all things," appears to be its motto; and to safety, working efficiency must take second place. Not long since we referred to the attack made against exposed terminals so generally met with in electric-cooking apparatus. Exposed grill elements are another source of danger to which attention has recently been called. With them the cook is in danger of receiving an ugly shock. The manufacturers are therefore urged to have the grill elements enclosed, and to make the whole of their apparatus shock and fool proof. Naturally there being so many types of apparatus on the market with exposed elements, the critic has been himself much criticized; but quite correctly he is not to be shaken off his point. But truth will out. If the element is not exposed, the heating efficiency is reduced; and there is the rub. Mr. Fellows, of Birmingham, holds that low temperatures dry up the food, and are not successful; and, in his opinion, the hot-plate method is like playing at cooking by electricity. Naturally, Mr. Fellows has been criticized for his frankness. However, the writer of "Cooking and Heating Notes" takes very seriously the matter of shocking users of electric appliances. He evidently fears a tragedy some day; and it is quite clear that he would not at all mind seeing the Home Office regulations, which are designed to protect from fire and shock in factories and workshops, applied to electrically equipped private houses, hotels, and restaurants—indeed, he emphatically adds, "as we hope will be the case eventually." When that happy time comes, "many of the less desirable forms of cooking and heating apparatus will either disappear, or be re-designed to meet the changed conditions. The "Electrical Times" ought to include among its specimen "copy" for advertisement purposes a list of persons who have met with their deaths from shock at voltages from (say) 110 to 250, with a warning attached not to use much of the electric cooking and heating apparatus on the market, unless terminals and elements are properly enclosed and protected, and the casings of the apparatus are properly earthed.

Healy on Fire Risks.

We have not the complete paper before us with which Mr. Louis T. Healy a short time since attempted to entertain and instruct the members of the Northampton and Bedford Insurance Institute. "Electrical Industries," however, raises the curtain a little bit to let its readers see the nature of part of the contents of the paper. Among other things, it seems that Mr. Healy suggested that blown-out bye-pass burners give off enough gas to cause a disastrous explosion. It does not appear that Mr. Healy called attention to any specific cases where this had occurred in connection with the millions of incandescent gas-burners in use in this country. He also apparently ignored the protection that there is in the invitation supplied by the extinguished bye-pass to a couple of the senses of every normal individual to correct matters—the bye-pass being extinguished cannot be seen as it can be usually, and escaping gas warns through the nasal organs that something requires remedying. On the other hand, electric short-circuits and wire-fusings give no notification of the mischief they are bent upon doing, until the mischief has actually commenced. Another extraordinary thing to which Mr. Healy, with great wisdom, calls attention is that mantles falling from their supports in an incandescent state constitute a "serious" fire risk. Our contemporary does not show that Mr. Healy cited any cases from among the millions of incandescent burners in this country where this has occurred. It would be useful to learn how long Mr. Healy imagines a piece of mantle remains incandescent after it leaves its incandescent flame. Of course, Mr. Healy has never heard of falling electric-lamps setting fire to premises, and causing a huge sacrifice of life. He never heard of the fire at Messrs. Arding and Hobbs, at Clapham, how many a home was darkened by the black disaster at Christmas time not long since, how the whole premises were destroyed, and how the insurance companies were made to "sit up" (as they have been over other very serious electrically generated conflagrations) all through a falling electric lamp. Such a thing, too, as falling incandescent carbon from arc lamps causing damage has never come within the knowledge of Mr. Healy. Then, says this same instructor as to the relative fire risks of electricity and gas, the concentrated heat from the chimney of an ordinary vertical burner has proved a great danger to wooden ceilings. We have not heard of such occurrences; but we have very intimate knowledge of electric wires having caused serious damage to wooden ceilings and panuelling.

The Reading of Statistics.

Mr. Healy has also been supplied with some statistics as to fires in London during 1912; and these statistics, judging from the paragraph in our contemporary, he has not been able to correctly interpret. He says that out of a total of 3387 fires, those due to artificial lighting were as follows: Candles, 187; electricity, 152; gas, 210; oil, 195; and lighted tapers, 9. Now the gas figures include not only lighting but heating. In 1912 the approximate number of electricity consumers was only 135,000 in the area of the London Fire Brigade; while the number of gas consumers was 1,220,397. Consider the relation of these figures to the number of fires; consider, too, that most of these gas consumers have gas-cooking stoves in use; consider, too, that many of them have gas-fires installed. Then, with knowledge thus extended, perhaps Mr. Healy will say which illuminant his figures show possesses more strongly than the other the virtue of safety. It is also stated that no fewer than 823 fires were caused by lights thrown down; and Mr. Healy's sapient remark here is: "Many of these lights, *no doubt*, were thrown down after lighting up gas-lamps." Is it just of Mr. Healy to talk in this loose fashion, with intent to injure a popular illuminating agent? "No doubt!" "No doubt" many of the lights were thrown down by electric light users after lighting cigars or pipes; "no doubt" many of them were thrown down after the servants of electric light users had been lighting fires. "No doubt"—— we will not proceed to imitate the foolishness of the assumption that Mr. Healy's sentence contains. Has he considered how it is that in London and elsewhere the number of fires labelled "Cause unknown" has increased so largely since electric lighting came into use. "No!" and an insurance man! Then we suggest he should do so.

The Boot on the Other Leg.

One of the curious things about the policy of the "Electrical Review" is what we sympathetically regard as its inconsistency. The use of gas on trains has ever been a sore point with it. Speak of the lighting of trains by gas, and a red rag waved before a bull could not have worse effect. We admit at once that, to the ill-informed, strong suspicion would be created as to escaping gas having a part in fires on trains after a collision; but those who know what happens to gas at several pounds pressure when suddenly released from a damaged cylinder can regard with easy conscience, mixed with amusement and pity, the ravings of those who give utterance to lay views. The "Electrical Review" is one of the papers that has disclosed a serious hiatus in its technical knowledge. Just as strenuous as the paper in question has been in its attack on the use of gas on trains has been its defence of the use of electricity in mines, though there is very strong suspicion attaching to its employment having been the cause of explosions and an enormous loss of life—loss of life which should have made those responsible for the editorial columns of our contemporary have many sleepless nights. We believe that the use of gas on trains caused them to have nightmare several times—that is, if we properly understood the "Lest we Forget" article that appeared in the columns of the "Review." But there has been no indication of nocturnal troubles over the use of electricity in mines. There was the Senghenydd explosion, in which 430 lives were lost. In that case the Coroner's jury were unable to say whether or not the gas was ignited by a spark from an electric wire, or whether a naked light in the lamp room was responsible. It cannot yet be said whether the inquiry by Professor R. A. S. Redmayne, the Chief Inspector of Mines, will be more elucidating; but in view of the increasing loss of life in mines—several isolated cases occurring of which the general public do not hear—it is to be hoped that something of value will issue. However, the "Review" does not believe the explosion could have been caused by a spark from the electric signalling wires. Probably it has never heard of such a thing happening. If so, it might look up the evidence concerning an explosion and three deaths at the Navigation Colliery at Bedwas in March, 1912. The verdict was to the effect that the gas was fired by a spark from an electric bell. After the accident the bell was replaced by a knocker. This is evidently the accident referred to by Mr. Nelson, the Chief Electrical Inspector of Mines, in his report for 1912. Experiments he afterwards made with the same electric bell proved that sparks from it when supplied with current from a battery (11½ volts) would ignite a mixture of gas and air. The "Electrical Times" also reports that recent experiments by Mr. Nelson show that "an explosion due to sparks from bare signalling-wires, under such conditions as those existing in the Senghenydd mine, was quite possible." Yet the "Review" has worked hard to present the innocence of electricity to its readers. But we question whether the mental faculties of the readers of our contemporary will allow them to swallow all that is put before them as to the safety of electricity. The manager of the Senghenydd mine has admitted that the bare wire system was in use at a spot where a fall and blower took place four or five years ago; and he added that the electric signalling apparatus was now being discarded, which shows that faith has been lost in it. Professor Redmayne, during the inquiry, pointed out that the use of unprotected electric signalling apparatus is a breach of the regulations.

Too Many "Ifs."

In an article upon mining accidents in the "World's Work" for January, Mr. T. Good asks whether the figures as to deaths in mines officially attributed to electricity give the whole story. He proceeds to put other pertinent questions: Have none of the recent big fires and explosions been due to electricity? Who can say? It is certainly worth remarking that disasters have become more frequent since the wide adoption of electricity in this country, and that they have the most disasters where they employ the most electricity—in the United States. It has been proved,

both here and in America, that gas and coal dust can be ignited by a tiny electric spark, or by a fused wire. It is, therefore, possible, if not probable, that some of our recent big disasters have been due to this agency. "The defenders of electricity," proceeds Mr. Good, "employ too many 'ifs' to be convincing. They tell us that electricity in the mine is quite safe *if* the apparatus is of the right kind, *if* the wires are properly armoured, *if* the installations are in charge of competent persons, *if* the mines are kept free from dust and gas, *if* the cables are not damaged, and so on." But how are we, he asks, to secure all these conditions? The apparatus is in constant danger of being damaged by falls of roof, bulges of side, and lumps of coal overhanging the tubs. Both sparking and fusing occur frequently; and, when something goes wrong, there is probably no electrician within a mile of the spot. Depend upon it, if coal owners will persist in using electricity in mines not always free from gas and dust, we shall have more and more, and bigger and bigger, disasters, as more men are employed on a shift in the larger mines.

NOTES FROM ABROAD.

A Record Day.

Jan. 14 was the coldest day experienced in Boston, U.S.A., for seven years, and the Consolidated Gas Company broke its previous consumption record (Dec. 24, 1912) by no less than 6·7 per cent., with an output of 22,485,000 cubic feet.

German Gas Publicity Centre.

The "Zentrale für Gasverwertung" publishes its gas-works statistics for last October, showing a gas production increase for 685 comparable works of 4·1 per cent. over the previous October. The increase in meter installations for 634 works was 8·4 per cent., and 452 works had a slot-meter increase of 31·6 per cent. The "Zentrale" announces at the same time a training course for lady demonstrators, which is given at the cost of bare expenses. The course costs about £6 10s., and lasts three weeks. This seems to be an excellent scheme for the proper training of lady demonstrators for gas publicity work.

Prepayment Meters in Paris.

The use of prepayment meters in Paris has made considerable progress as the result of the efforts of the Gas Company to popularize them. According to the report presented to the Municipal Council by M. Dausset, the member who has charge of these matters, the placing of prepayment meters, which was commenced in 1911, was general all over Paris in March last year; and by Oct. 31 the Company obtained 3144 new consumers. Another movement made by the Company had been in the direction of fitting these meters in hotels, in order to facilitate the use of gas by the occupants of apartments. The number of hotels in which gas has been adopted under the conditions referred to stood at 122 at the end of October; comprising 2008 rooms furnished with prepayment meters. In each case the system has been found to work satisfactorily; cases of fraud being very few in number.

Continental Coal in 1913.

The coal production of Germany in 1913 was 191,511,000 tons —an increase of 14,416,000 tons on the previous year. Nearly 32,168,000 tons of coke were produced, which was an advance of 3,026,000 tons on the 1912 output. More coal and anthracite were also imported to the extent of 159,500 tons, making a total for the year of over 10,500,000 tons. The output of coal in Austria last year amounted to 16,336,000 tons, or an increase on the previous year of 538,700 tons. The make of coke was 2,584,000 tons—an increase of about 276,300 tons. The output of coke has doubled itself since 1900.

Gas Poisoning Test.

A resident of Fort William, Ark., U.S.A., recently sued the Gas Company for heavy damages for the death of his infant son, alleged to have died from the effects of natural gas escaping from faulty pipes. The Company maintained that death was due to fumes from improperly consumed gas. In support of their case they found seven persons who were willing to remain for five hours in an apartment into which were escaping 40 cubic feet of gas each hour. At the end of the time no effects of the gas were found on any of them. However, the "American Gaslight Journal," in recording this proceeding, gives no details as to the size of the room or the ventilation.

Gas in Turkey.

The authorities at Constantinople are open to receive offers for the right to supply gas for 50 years in the communes of Pera and Yenikeuy on the European shore of the Bosphorus. There were no applications for the previous offer last August. This is not surprising, considering the terms stipulated. A sum of £42,435 (Turkish) has to be paid for the present works, which have then to be demolished, and new ones built. A fixed sum has to be paid to the authorities, on the amount of which depends the competition. Besides this, there is a contribution of 2 paras on each cubic metre sold (more than 3d. per 1000 cubic feet), not to mention free lighting of the Imperial Palace, a certain amount of free public lighting, and sundry other charges.

Rare Earths.

In the course of an article last year in the "Zeitschrift für angewandte Chemie" (No. 26), Herr E. Stern stated that the incandescent mantle industry uses some 300 tons of thorium nitrate yearly, representing about 3300 tons of monazite sand. The bye-products of the manufacture include over 1000 tons of cerium oxide, of which the mantle industry needs only 3 tons. A ton of sand costs £30, and contains 2 milligrammes of recoverable radio-active mesothorium, worth £30. Of the cerium oxide produced, some is used for sparking alloys for cigar lighters, some for impregnating arc-light carbons, some by the dyeing and photographic industries, &c. Weight for weight, mesothorium is 300 times more active than radium, but it breaks down much sooner. Some 25 per cent. of its radio-activity is due to inseparable radium.

Coal "Economizers."

Several of the technical papers on the Continent recently have given warnings against the so-called coal "economizers," which are offered under various high-sounding names, and which are not unknown on this side of the Channel. These on analysis are mostly found to be mixtures of common inorganic salts, which cannot have any possible effect on the combustion of coal. The directions given are generally to dissolve them in water and pour the solution over the coal, and the result is to be the development of great heat, smokeless combustion, and anything from about 15 to 33 per cent. saving of coal. The "Wochenschrift für Brauerei" shows up the composition of some of these and the astounding prices asked for them, and warns the public most strongly against them.

Progress in France.

The meeting was held on Dec. 13 last of the Compagnie Française d'Eclairage et de Chauffage par le Gaz, when the report and accounts for the year ended June 30, 1913, were presented. The Company, with a total capital value of 10,700,000 francs, has a wide sphere of operation, including some thirty towns, of which perhaps Calais is the best known. In the year under consideration the sales of gas amounted to 965½ million cubic feet—an increase of about 5·7 per cent. on the previous year. The number of gas consumers increased by nearly 13 per cent. The General Lighting Company of Bordeaux, which, since its formation in 1904, has had so many bad years, has better things to report for the year ended June 30, 1913. It can show a net profit of 482,442 frs. as against 48,549 frs. for the previous period. Even now the Directors deem it inadvisable to declare a dividend, preferring to form a general amortization fund.

Gaseous v. Direct Heating.

The advantages of gaseous heating as compared with direct heating with a hearth were the subject of a recent communication by M. Paul Cousin to the "Bulletin de la Société Industrielle du Nord de la France." The author, as the result of an elaborate series of calculations, came to the conclusion that the great regularity of working, the high temperature reached, and the economy resulting from the great yield of heat, which enabled combustion to be attained without excess of air, made gaseous heating incontestably superior to direct heating. He gave a table showing that, under the best conditions, the maximum theoretical yield could reach, in the case of a steam-boiler, 88·8 per cent.; whereas yields ranging from 77 to 85·83 per cent. only could be obtained with direct heating. Another point, which the author expressed his intention of dealing with on a future occasion was that the management of an improved gas-generator required much less skill on the part of the workmen than a furnace.

Heating-up New Furnaces.

In the "Keramische Rundschau" (No. 42) last year appeared an article on this subject by Herr G. Weigelin. The essence of his advice is "weak firing and strong draught at the beginning, and strong firing and weak draught at the end." He gives special directions for each day up to the fourteenth as to what doors are to be open and how wide, and how much of the fire-bar surface is to be covered. Care must be taken that the furnace is only smoked and not burned. Wood burns too quickly and develops too much heat, coal being better suited for the purpose. It is wrong to shut up everything in the evening in order that the furnace shall not cool down. On the contrary, everything should be left overnight as during the last period of working. The air that is drawn in will, it is true, have a cooling effect, but it also has an excellent drying effect. The slower the heating-up, the better for the lasting qualities of the furnace. No new furnace will dry by simply being allowed to stand cold. Even after standing for months it must be heated-up with the same care, in order to avoid disaster.

Gripping Power of Portland Cement.

This subject was recently dealt with by Herr H. Luftschitz in "Ionind. Zeit." [Vol. XXXVII., 1491]. The setting of portland cement is assumed to be due to the formation of a gel, which ultimately hardens to a lime-aluminate-silicate mass, and forms a close-fitting network around any embedded inert material. With concrete, such a network surrounding angular gravel or sand would be stronger than one enclosing rounded grains; and the strength attained with washed sand would be greater than unwashed, since in the latter case the intervening layer of soft clay prevents the surrounding network from directly gripping the grains of sand. Similarly, with ferro-concrete, rust is detrimental, preventing close contact between the iron and surrounding gel.

GERMAN COAL FOR LONDON GAS.

THE daily papers last week gave circulation to the statement that the South Metropolitan Gas Company have contracted for a supply of 350,000 tons of coal from Germany; and the news has caused something more than a flutter in the Northern coal markets, where such action was not expected on the part of any one of the gas companies who have been so badly hit of late by the action of the British coal proprietors, who still think it sufficient to talk of the laws of supply and demand, and not of such laws, *plus* a growing export of British coal for the use of other countries, and a cast-iron desire on the part of the coal owners to get, while conditions were favourable, the utmost farthing from their customers. The South Metropolitan Company themselves do not confirm or deny the newspaper reports. They prefer to adopt a mysterious reticence over the rumour. But a matter of this kind does not get abroad without there is some foundation for it. The Company at the time of the strike of 1912 purchased German coal; and before then the Gaslight and Coke Company found it was as easy to get coal from Germany as from the North. The Chairman of the South Metropolitan Company (Mr. Charles Carpenter, D.Sc.) has told the proprietors on previous occasions that the new modes of carbonizing for gas production, the lower illuminating power standard to which they are now working, and the new process of purification which they have adopted (whereby the carbon bisulphide is converted into sulphuretted hydrogen, and removed by the simple oxide process), all contribute to greater liberty in the selection of coal. There is something else. The strong Westphalian Coal Syndicate, we believe, supply coal for export at lower cost than they supply coal for gas making for home use. This may not strike us as being fair; but if it is so now, there is no reason why use should not be made of a very valuable fact. The amount of coal mentioned as having been contracted for is rather less than one-third the quantity carbonized by the South Metropolitan Company last year—this having been 1,125,779 tons. However, the amount mentioned as having been contracted for —350,000 tons—is a very substantial one; and the Northern coal-owners will begin to consider whether they have not gone a bit too far in forcing up prices against the gas industry when business in coal can be transferred from them in such huge slices.

One newspaper report last Saturday said: "It was stated on the Newcastle Exchange yesterday that the report that one of the London Gas Companies had bought a large quantity of gas coal from Germany was confirmed. A quarter of a million tons of Westphalian coals have been definitely bought through a well-known German firm of merchants, and another 100,000 tons are under negotiation. The two big London Companies buy yearly about 3½ million tons, nearly all from Durham; so there are still over 3 million tons to allot under this year's contracts. The German competition, however, is being considered seriously in Durham mining circles."

The "Commercial Notes" in the "Newcastle Chronicle" last Saturday contained the following reference to the matter:

> The news that the South Metropolitan Gas Company has purchased 350,000 tons of German coal on this year's account must be taken, if true, as indicating a serious break-away from tradition and practice. The South Metropolitan Company have on several occasions of late purchased small quantities of coal from Westphalia; but the bulk of its supplies, amounting to 1½ million tons, and nearly the whole of the Gas Light and Coke Company's requirements, totalling yearly to 2 million tons, have been purchased from the Durham coal-fields. . . . The present large sale which is reported—and reported, we are informed, on good authority—may mean that other large purchases are to be made in Westphalia, or that it is to be used as a lever in forcing down prices when the Companies come into the Durham market within the next week or two. Both the big London Gas Companies, in common with other concerns of the sort, have been suffering in recent years from the handicap of dear coal. . . . Evidently the South Metropolitan Company have gone to Germany for a solution; and it remains to be seen what the result will be when the negotiations with the Durham coal-owners are opened in earnest. It is generally expected that the new contracts for 1914 would be closed at a substantial reduction on the figures of the current contracts. Whether, however, this reduction is to be 1s. per ton or 1s. 6d. or 2s. or more, will probably depend upon the price which has been paid to the Germans—always assuming, of course, that the sale reported has really taken place. In any case this German competition is a contingency which would have to be met, as the Westphalian Syndicate are more than ever determined to get rid of their large surplus output.

WORKS TOPICS—XX.

By "Modus Operandi."

THE CHANGE IN GAS-WORKS PLANT.

THE increasing use of mechanical appliances for handling material in gas-works, and the repairing shops rendered necessary for maintaining this machinery in good working order, have been the means of finding openings for the mechanical engineer to look after such plant.

In scores of works great changes have been taking place during the past ten or fifteen years. Where formerly there were the exhauster engine, a boiler, a crane, and a few pumps, there are now several cranes—steam, hydraulic, and electric—elevators and conveyors for coal and coke, breakers and screens, and hydraulic and electric retort charging and discharging machines of very complicated construction. There are, too, hydraulic pumping engines and accumulators, electric generating plant, boilers under high steam pressure, fitted in many cases with up-to-date accessory plant requiring careful manipulation. This by no means exhausts the mechanical plant, for there are usually several gas-engines and electric motors to keep in good running order, mortar mills, stone breakers, lifts, water-gas machinery, breeze washers, artesian well pumping arrangements and a variety of machines in the workshops, which in themselves comprise properly equipped engineers', carpenters', and smiths' shops. Machinery in purifying houses and sulphate plants combine to make ample work for an experienced and energetic mechanical engineer.

THE GAS ENGINEER OF TO-DAY.

A gas engineer cannot possibly be expected to be a highly trained civil and mechanical engineer, an expert chemist, and an experienced gas maker and distributing engineer all rolled into one. This is impossible. Usually the best men have a fair all-round knowledge of the duties of the above, and, in some cases, have, in addition, an expert knowledge of one particular branch of the work according to their special training and their personal aptitude. Much of their time must necessarily be occupied in purely commercial matters, which has the effect of concentrating on their assistants a large part of the work connected with the technical side of gas engineering and manufacture.

Largely owing to the great progress that has been made during the past decade in gas-works plant, I feel sure that in many large works mechanical plant has been added year by year without the provision of any additional arrangements for ensuring proper and efficient supervision of this valuable machinery. Thousands of pounds are spent on plant of this description; but often no thought is given to the extra supervision required. It is not sufficient to engage another mechanic. This is necessary, no doubt; but what is much more necessary is the engaging of a properly trained brain to control, maintain, and frequently to improve, the plant that has been installed to save in many cases thousands of pounds per annum.

Mechanical plant invariably requires periodical examination; and no one but an expert mechanical engineer can do it properly. Quite a number of gas engineers are expert mechanical engineers; but if so, they are more often than not incompetent chemists; while they may or may not have an adequate knowledge of civil engineering. In the same way many gas engineers are expert chemists; but their knowledge of mechanical engineering is strictly limited. As a result, such necessary supervision is, in many cases, likely to be very deficient.

THE NEED OF THE MECHANICAL ENGINEER.

The point I wish to make is that, firstly, there is an ever-increasing need for the gas engineer to study mechanical engineering, civil engineering, chemistry, and commercial management and business methods. Secondly, it is of the greatest importance that the complete change that has taken place in large, and even medium-sized, works should be realized by those in a position to arrange the staff in such works. It cannot pay to allow plant that has cost many thousands to be operated by men whose mechanical knowledge fifteen years ago was limited to the exhauster engine and a few pumps. Specializing is the order of the day. In works where there is machinery to the value of from (say) £20,000 to £50,000 in daily use, I have no hesitation in saying that such works should also have a properly-trained mechanical engineer at £250 a year to look after it. A good man could, and would, do wonders in many a large works, which, so far as the machinery is concerned, is too often under the charge of a foreman mechanic, who has no idea of indicating an engine, taking an evaporation test on boilers, nor does he know what is taking place in the mechanical world. He is usually so hard worked that, even had he the requisite knowledge, he would have no time to do anything more than keep the machinery running. Whether it is running at high or low efficiency is a matter of quite secondary consideration—and no wonder.

The remedy in large works lies in the suggestion already made. In smaller works it is impossible to do more than engage one of that excellent type of mechanic who has risen to the position of erector to some engineering contractor. These men are usually resourceful and hard-working, and have had a sound training in large machine shops. They are invariably picked men, and are often found to have a desire to settle down in a permanent job.

THE FUTURE WORKS ENGINEER.

Is it too much to expect of the rising gas engineer—I mean the student who has only just started—that he should have a sound training in mechanical engineering? For the young engineer whose ambition it is to manage gas-works, I put this branch ahead of civil engineering or of chemistry, for the reason that gas-making is becoming year by year more dependent upon machinery. In ten or fifteen years' time, so long as the machinery is running, gas-making will be a straightforward operation. In fact, it is getting to this stage in plenty of large works at the present day. This being so, the young engineer with special mechanical training will be the valuable man in gas-works in the future; and this should be taken into account when engaging assistants.

COMPARATIVE WORKING RESULTS OF THE LONDON AND FOUR SUBURBAN GAS COMPANIES.

IN THE HALF YEAR ENDED DECEMBER 31, 1913.

Compiled by Mr. F. J. BRADFIELD, the Secretary of the Commercial Gas Company.

——	Gaslight and Coke.	South Metropolitan.	Commercial.	Brentford.	Wandsworth.	South Suburban.	Tottenham.
Gas sold . . . . . thousands	13,357,753	6,632,033	1,817,421	1,682,151	1,188,978	1,015,911	977,784
Increase . . . . . per cent.	Dec. 1·78	1·56	0·10	4·26	8·05*	2·04	4·87
Gas made per ton of coal . . . . cubic feet	12,306	12,734	13,726	12,020	12,647	12,943	13,206
„ „ per gallon of oil . . . . „	431	..	449	451	707	..	460
Gas unaccounted for . . . . . per cent.	6·84	5·40	7·30	6·96	7·38	8·48	7·42
Coke made for sale per ton of coal . cwts.	9·97	9·75	10·97	10·52	10·45	10·46	9 19
Tar made per ton of coal . . . . galls.	10·23	9·73	10·42	10·21	9·57	9·91	..
Liquor made per ton of coal . . . galls, 8 oz.	37·01	41·28	39·67	34·93	36·33	39·51	38·31
Percentage of coke used as fuel	20·32	21·09	12·25	15·86	16·40	19·50	25·00
Capital expended per 1000 cubic feet sold during the past year	s. d. 10 10·20	s. d. 7 10·95	s. d. 8 6·09	s. d. 7 2·45	s. d. 7 2·91	s. d. 9 11·07	s. d. 7 9·34
Price charged per 1000 cubic feet	2/6 to 3/- 2/2	2 2	2 4	2 4	1/9, 2/5, 2/10½	2/3 to 4/-	2 1
Costs per 1000 Cubic Feet of Gas Sold.							
REVENUE ACCOUNTS.	d.	d.	d.	d.	d.	d.	d.
Coals, oil, &c.	15·66	16·86	15·07	15·26	18·44	19·93	15·38
Less residuals—Coke and breeze	6·99	7·35	5·25	4·96	7·22	7·32	4·89
Tar	1·61	1·96	1·53	1·40	1·82	2·15	1·33
Amm. liq. and sulph. amm.	2·03	2·59	1·75	0·97	1·94	2·40	1·34
Total residuals . . .	10·63	11·90	8·53	7·33	10·98	11·87	7·47
Net for coals . . .	5·03	4·96	6·54	7·93	7·46	8·06	7·91
MANUFACTURE—							
Salaries	0·28	0·63	0·39	0·40	0·23	0·55	0·28
Wages—carbonizing	1·85	1·84	1·55	1·39	1·75	1·18	1·45
Purification	0·35	0·74	0·19	0·26	0·34	0·10	0·30
Repairs—plant	4·67	4·40	3·80	6·23	4·05	3·28	4·23
Net manufacture . .	12·18	12·57	12·47	16·21	13·83	13·17	14·17
DISTRIBUTION—							
Wages and salaries	1·09	0·77	0·81	1·18	1·26	1·47	1·07
Repairs—Mains and services, &c.	2·19	1·58	1·56	2·60	2·21	2·61	3·67
„ Meters and prep. meters and fittings	1·45	3·03	1·97	0·99	1·35	2·31	1·43
„ Stoves—ordinary and prepayment .	1·90	1·54	1·59	1·79	2·04	1·40	1·24
Total net manufacture and distribution .	18·81	19·49	18·40	22·77	20·69	20·96	21·58
Public lamps—lighting and repairing	0·50	0·62	0·38	0·50	0·61	1·06	0·33
Rents, rates, and taxes	2·90	2·06	2·15	1·84	1·02	2·02	1·90
MANAGEMENT—							
Directors, Auditors, and salaries (Secretary, &c.)	0·24	0·26	0·31	0·45	0·60	0·76	0·45
Collectors	0·48	0·60	0·70	0·53	0·45	0·55	0·45
Stationery and general charges	0·28	0·52	0·41	0·31	0·44	0·55	0·61
Profit-sharing	0·41	0·72	0·53	..	0·50	0·71	0·49
Bad debts	0·11	0·08	0·05	0·08	0·05	0·04	0·04
Law and parliamentary charges	0·04	0·04	0·03	0·04	0·02	0·01	0·80
Superannuations, &c.	0·51	0·22	0·32	0·49	0·43	0·68	0·07
National Insurance	0·08	0·06	0·08	0·07	0·10	..	0·07
Sundries	0·03	0·01	0·02	0·03	0·01	..	..
Total expenditure (*less* residuals) . . .	24·39	24·68	23·38	27·11	24·92†	27·34	26·79
GAS	29·40	25·50	27·59	28·15	25·36	30·50	25·24
Rentals—Meters and prep. meters and fittings	3·02	3·32	3·05	3·52	2·89	2·49	1·93
Stove	1·26	1·32	1·65	0·99	2·16	1·61	3·84
Incand. mantle maintenance . . .	..	..	0·11	..	0·43	..	0·18
Miscellaneous	0·10	0·05	0·01	0·01	0·15	0·07	0·06
Total—Gas, rentals, &c.	33·78	30·19	32·41	32·67	30·99	34·67	31·25
Balance, being profit	9·39	5·51	9·03	5·56	6·07	7·33	4·46
Dividend and interest	10·85	6·36	8·94	7·20	6·82	9·02	5·57
Surplus	Def. 1·46	Def. 0·85	0·09	Def. 1·64	Def. 0·75	Def. 1·69	Def. 1·11
Contribution to funds	0·27†	..	..	..	..	..	..
SUNDRIES.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Coals cost per ton	16 5·89	16 8·63	16 10·86	17 7·1	18 2·29	19 5·40	18 3·81
Coke realized per ton of coal	7 7·61	7 1·80	7 5·21	7 6·99	7 0·80	6 10·34	6 10·36
Coke „ „ of coke	15 3·68	14 7·97	13 6·66	14 4·98	13 6·31	13 1·36	14 11·13
		Per Yard.				Per Yard.	Per Chal.
Breeze „ per ton	4 7·51	1 3·04	3 1·35	2 5·77	2 9·07	2 6·88	1 10·77
Tar realized per gallon	0 2·22	0 2·40	0 2·20	0 2·08	0 2·31	0 2·54	0 2·13
Amm. liquor, &c., realized per butt (8 oz.) . .	6 11·31	6 8·61	6 11·77	4 7·33	5 9·89	6 4·89	5 6·79
Percentage of stoves at rental to consumers . .	76	95	66	78	..	89	56
Bad debts per cent. on total receipts.	0·25	0·18	0·14	0·20	0·13	0·19	0·09
Net profit per cent. on ordinary capital . . .	3·87	3·64	5·49	9·39	5·29	4·58	4·43
One penny variation equals in half year . . .	£55,657	£27,633	£7156	£7009	£4954	£4233	£4074
Carb. water gas, per cent. on total make . . .	19·59	..	28·82	40·28	4·76	..	32·22

† Redemption Fund.

* On Amalgamated Co.'s figures. † Amount paid Stamp Duty eliminated.

The London and Southern District Junior Gas Association.—A meeting of the Association will be held next Friday, at the Westminster Technical Institute, when Mr. G. Stanley Cooper (of the Koppers Coke-Oven and Bye-Product Company) will deliver a lecture, illustrated by lantern slides, on "Carbonization in Bulk for Gas Production." The Hon. Secretary (Mr. Ernest Scears) reminds members who have not yet applied for tickets that the annual dinner will take place on Saturday, the 28th inst.

COMPARATIVE WORKING RESULTS OF THE LONDON AND FOUR SUBURBAN GAS COMPANIES.

TABLE SHOWING THE VARIATION, INCREASE OR DECREASE, ON FIGURES OF CORRESPONDING HALF YEAR, 1912.

[The figures in heavy type show the decreases.]

Compiled by Mr. F. J. BRADFIELD, the Secretary of the Commercial Gas Company.

	Gaslight and Coke.	South Metropolitan.	Commercial.	Brentford.	Wandsworth.	South Suburban.	Tottenham.
Gas sold . . . . . thousands	**242,606**	102,055	1,786	68,767	580,322*	21,283	45,409
Increase (variation equal to) . . . per cent.	**9·04**	**4·65**	**3·74**	**5·98**	·93	**1·25**	**7·91**
Gas made per ton of coal . . . . cubic feet	264	240	768	**24**	941	823	266
,, ,, per gallon of oil . . . . ,,	**15**	..	29	61	314	..	..
,, unaccounted for . . . . . per cent.	·71	·10	1·92	**·58**	·96	·76	**3·07**
Coke made for sale per ton of coal . cwt.	·06	·52	·08	**·36**	**·36**	·65	·07
Tar made per ton of coal . . . . galls.	·69	..	..	**·24**	**·45**	·02	..
Liquor made per ton of coal . . . galls, 8 oz.	·89	·43	1·44	·72	5·50	·57	·84
Percentage of coke used as fuel	**1·35**	**4·16**	**·62**	2·83	2·85	1·22	1·01
Capital expended per 1000 cubic feet sold during the past year	s. d. **0 1 09**	s. d. **0 1·26**	s. d. **0 0·93**	s. d. **0 4·63**	s. d. 0 7·19	s. d. **0 1·06**	s. d. 0 0·58
Price charged per 1000 cubic feet	..	..	..	**0 1·00**	..	..	**0 1·00**
Costs per 1000 Cubic Feet of Gas Sold.							
REVENUE ACCOUNTS.							
Coals, oil, &c.	d. 1·31	d. 2·33	d. 2·20	d. 1·40	d. 3·24	d. 2·01	d. 0 86
Less residuals—Coke and breeze . . .	**·02**	·14	**·09**	**·44**	**1·41**	**1·24**	**·86**
Tar	·24	·25	**·15**	**·09**	**·02**	·02	**·34**
Amm. liq. and sulph. amm .	**·16**	**·28**	**·07**	**·27**	**·02**	**·06**	·00
Total residuals . . .	·06	·11	**·31**	**·80**	**1·45**	**1·28**	**1·20**
Net for coals . . .	1·25	2·22	2·51	2·20	4·69	3 29	2·06
MANUFACTURE—							
Salaries	·01	·04	·00	·03	**·02**	**·18**	**·01**
Wages—carbonizing	**·24**	**·05**	·03	**·12**	**·39**	**·47**	·11
Purification	·06	**·14**	·05	**·01**	·08	**·22**	**·03**
Repairs—plant	·16	**·80**	**·78**	·71	**1·97**	**·04**	**1·49**
Net manufacture . .	1·24	1·27	1·81	2·81	2·39	2·38	·64
DISTRIBUTION—							
Wages and salaries.	·04	**·01**	·08	**·01**	·15	·25	·09
Repairs—Mains and services, &c. . . .	·31	**·16**	·28	**·08**	·37	·51	**·50**
,, Meters and prep. meters and fittings	**·59**	·22	**·03**	**·02**	·13	**·46**	**·06**
,, Stoves—ordinary and prepayment .	·02	·03	·06	·31	·86	**·13**	·23
Total net manufacture and distribution .	1·02	1·35	2·20	3·01	3·90	2·55	·40
Public lamps—lighting and repairing . . .	**·01**	**·02**	**·01**	**·09**	·05	·17	**·30**
Rents, rates, and taxes	**·08**	·03	·06	**·07**	·12	·53	·02
MANAGEMENT—							
Directors, Auditors, and salaries (Secretary, &c.)	·01	·01	**·03**	**·05**	**·16**	**·29**	**·03**
Collectors	·01	·00	·01	**·02**	·02	**·01**	**·05**
Stationery and general charges	**·03**	·00	..	·00	·09	**·06**	·06
Profit-sharing	·02	·13	·01	..	**·01**	·05	**·02**
Bad debts	**·01**	·01	**·02**	·01	**·01**	·00	·01
Law and parliamentary charges	·02	**·02**	**·01**	·02	**·44**	**·38**	·76
Superannuations, &c.	·02	**·27**	**·04**	·10	·26	·22	**·01**
National Insurance	·01	**·04**	·02	·01	·02	...	**·01**
Sundries	·co	·00	·00	·03	·00	..	..
Total expenditure (*less* residuals) . . .	·98	1·18	2·19	2·95	3·84	2·78	·83
GAS	**·10**	**·03**	**·01**	**·98**	4·03	·37	**·86**
Rentals—Meter and prep. meter and fittings	·11	·23	·15	·20	**·63**	·26	·00
Stove	·12	·06	·07	·09	·97	·09	·10
Incand. mantle maintenance . . .	·00	..	·00	..	·14	..	**·02**
Miscellaneous	·00	**·01**	·01	·01	**·10**	·03	·03
Total—Gas, rentals, &c.	·13	·25	·22	**·68**	4·41	·75	**·75**
Balance, being profit	**·85**	**·93**	**1·97**	**3·63**	·57	**2·03**	**1·58**
Dividend and interest	·24	**1·24**	**·01**	·04	·82	·34	·17
Surplus	**1·09**	·31	**1·96**	**3·67**	·25	2·37	**1·75**
Contributions to funds	**·35**	..	..	..	..	..	**·26**
SUNDRIES.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Coals cost per ton	1 10·27	2 6·95	2 3·66	2 10·9	4 3·50	2 5·42	2 5·88
Coke realized per ton of coal	0 2·64	0 3·33	**0 4·00**	0 0·16	**1 8·93**	**1 5·46**	**0 6·36**
Coke ,, ,, of coke	0 4·20	**0 2·75**	**0 8·50**	0 5·99	**2 9·38**	**3 10·18**	**1 3·50**
		Per Yard.				Per Yard.	Per Chal.
Breeze ,, per ton	**1 1·25**	**0 0·83**	**0 1·98**	**0 3·19**	0 5·53	0 1·21	**0 0·58**
Tar realized per gallon	0 0·27	0 0·35	**0 0·18**	0 0·15	0 0·10	**0 0·03**	0 0·02
Amm. liquor, &c., realized per butt, 8 oz. . .	**0 5·57**	**0 7·94**	**0 9·36**	**0 11·31**	**1 3·92**	**0 4·59**	0 4·64
Percentage of stoves at rental to consumers . .	4	2	2	..	..	9	5
Bad debts per cent. on total receipts	**·02**	**·01**	**·03**	**·02**	**·02**	**·10**	**·02**
Net profit per cent. on ordinary capital . . .	**·74**	**·84**	**1·35**	**6·57**	**·78**	**1·56**	**2·08**
One penny variation equals in half year . . .	**£1011**	£425	£8	£287	£2418	£89	£189
Carb. water gas per cent. on total make . . .	1·91	..	**4·49**	4·93	**8·83**	..	..

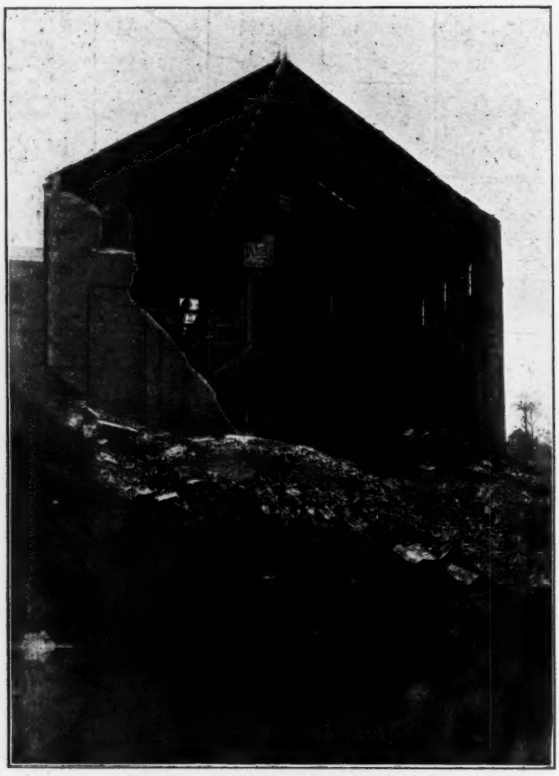
* These figures represent the variation on the absorbing Companies' own figures, and not on those of the amalgamating Companies, whereas on the preceding table the increase on the "Gas Sold" is on the amalgamated figures.

Presentation to Mr. A. B. Tobey.—Mr. A. B. Tobey, of Durham, whose appointment as Manager to the Townsville (Queensland) Gas and Coke Company has been already reported in our columns, was on the 7th inst. presented with a solid leather kit-bag subscribed for by the employees at the Durham Gas-Works. Mr. Tobey was also the recipient of a case of pipes, presented by the office staff; and the mainlayers and fitters presented him with a shaving set.

RETORT-HOUSE GABLE COLLAPSE.

£3000 Damage at Brierfield.

An alarming accident occurred early on Wednesday morning last at the Brierfield Gas-Works of the Nelson Corporation—a brick wall, 90 feet high and 86 feet wide, forming the gable end of the retort-house and store-room, collapsing and causing damage to the extent of £3000. Work was in full swing when, without the slightest warning, a tremendous crash was heard; and the men then saw the wall fall away and break into thousands of fragments. Part of the masonry fell into the canal, which runs at the rear of the works. Fortunately, the structure fell towards



The Damaged Retort-House at Nelson.

the canal. Had it fallen inwards, several lives must have been lost, as a number of men were at the time following their work in the retort-house. No damage was done to anything but the wall. For some time it had been noticed that the foundations were showing signs of weakening; but no immediate danger was anticipated. Mr. A. Morton Fyffe (the Gas Engineer) stated that the affair created much excitement among the men at the works; and it was very lucky that none of them met with an injury. He attributed the collapse to the subsidence of the canal bank immediately below the building.

To avoid any misunderstanding, it should be pointed out that the gable which has collapsed has no connection whatever with the vertical-retort installation erected by the Nelson Corporation two years ago. At the Brierfield works there are no vertical retorts. The gable in question has been built fifteen years; and the house contains nine beds of inclined retorts.

STEAM RAISING BY GAS COKE.

In the last number of the "Journal" (p. 363), we gave some figures supplied by Mr. S. Tagg, of Preston, to the "Bulletin" of the British Commercial Gas Association in regard to the use of coke for raising steam. We have since received for publication the following results of some evaporation tests officially conducted, under the direction of the London Coke Committee, on boilers at an important municipal pumping-station near London.

The boilers are the ordinary Cornish type, and the full normal evaporative capacity was maintained during the tests without alteration to the existing furnaces or draught conditions. Ordinary medium-sized gas coke was fired exclusively during the tests, at intervals of 30 to 40 minutes. The competing fuel was smokeless Welsh coal, which was usually stoked at intervals of about 20 minutes. The results obtained demonstrate the comparatively high efficiency of gas coke as a steam-raising fuel, and its adaptability to existing conditions. The feed-water test-meter had been previously checked, and was correctly calibrated within fine limits. The coke fuel was weighed in small lots immediately before firing. Intervals of 1½ hours were allowed in order to establish coke-fires prior to the commencement of the tests, which were twice repeated with similar results. The draught (natural) available was 0·125 inch at the furnace doors.

Duration of tests	4 hours	
Steam pressure—		
Maximum	103·0	lbs.
Minimum	101·0	,,
Mean	101·5	,,
Feed temperature, average	175°	Fahr.
Total coke fired	1680	lbs.
Average per square foot of grate per hour	12·7	,,
Total water evaporated	16,170	,,
Water evaporated per pound of coke, actual	9·620	,,
Factor of evaporation	1·078	,,
Water evaporated per pound of coke as fired from and at 212° Fahr.	10·370	,,

Though gas coke is now being used extensively on all types of boilers in London, the Committee's experience is that the efficiency of this fuel for steam-raising purposes is little understood by engineers in charge of boiler plant; and it is hoped that the above authenticated test figures may prove useful in dissipating prejudice and in extending the use of gas coke fuel for industrial purposes. The comparatively high efficiency of coke fuel for evaporating and general heating purposes is explained in a booklet entitled "Moments with a Fuel Expert," single copies of which are issued gratis by the Committee at No. 39, Victoria Street, S.W.

WATER LEGISLATION FOR 1914.

Provisional Orders.

In the last number of the "Journal" the provisions in regard to the supply of water in the Bills promoted by companies and local authorities were dealt with. We now notice those contained in the Provisional Orders; taking first those for which applications have been made to the Board of Trade.

The Amersham, Beaconsfield, and District Water-Works Company, Limited, seek confirmation of the construction of the existing works and authority to carry out others, consisting of a service reservoir in the parish of Amersham, and a conduit commencing thereat and terminating by a junction with the existing main of the Company in the road leading from Amersham to Beaconsfield. The works are to be completed within the time, and subject to the conditions, prescribed by section 11 of the Gas and Water Works Facilities Act, 1870. Additional capital to the amount of £40,000, including premiums, is required; and the whole of the Company's capital is not to exceed £86,000, unless authorized by Parliament. If raised as ordinary capital, the dividend is not to exceed 7 per cent.; if as preference capital, not more than 5 per cent. Borrowing powers to the extent of one-third of the capital actually raised are asked for. The other provisions of the Order include authority to sell meters and fittings and to supply the latter. [*Parliamentary Agents: Messrs. Torr, Durnford, and Co.*]

Application is being made by the Elham Valley Water Company, Limited, for authority to extend their limits of supply, acquire more land, construct additional works, and raise further capital. The new limits are the parishes and places of Monks Horton, Sellindge, and Lympne, in the rural district of Elham, and a portion of the parish of Aldington, in the rural district of East Ashford, in the county of Kent. The additional works are a reservoir in the parish of Lyminge and two conduits or pipe-lines; and they are to be completed in accordance with the provisions of the General Act already mentioned. More capital to the amount of £11,500, including premiums, is applied for; making with that already sanctioned £21,000, which is to be the limit unless an increase is authorized. Borrowing powers are not to exceed one-third of the capital actually raised, including premiums. [*Parliamentary Agents: Messrs. W. & W. M. Bell.*]

The Fisherton Anger and Bemerton Water Company wish to extend their limits of supply so as to include the tything of Quidhampton, in the parish of Bemerton, in the rural district of Wilton, in the county of Wilts; and they apply for the necessary authority to do so, and to exercise within the extended limits all the powers of supply they now possess in regard to the present area. [*Parliamentary Agents: Messrs. Taylor, Hoare, and Jelf.*]

Authority is required by the Flint Gas and Water Company, Limited, to construct additional works, consisting of a line or lines of pipes in the parish of Northop, and another in the parish of Flint. The Company ask to be empowered to use for the purposes of their undertaking any water purchased or received by them from the Halkyn District Mines Drainage Company. Further capital to an amount not exceeding £2000 is required; and the nominal capital is not to be more than £7600. The dividend is limited to 7 and 6 per cent.; and the borrowing powers to one-third. The provisions of the Order are of the usual character. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The following applications have been made to the Secretary for Scotland, under the Private Legislation Procedure (Scotland) Act, 1899.

The Clydebank and District Water Trustees apply for an extension of time for completing the works authorized by the Clyde-

bank and District Water Order, 1910, and for power to raise more money. The further period mentioned is seven years from Aug. 3, 1917; and the Trustees require £68,000 for the completion of the Burncrooks reservoir and the new filters at Cochno, and for the construction of certain works specified in the above-named Order; £22,000 for covering the Kilbowie reservoir, for extra service-tank accommodation, and for additional supply and service pipes; and the amount required for paying the costs of the Order. The periods named for the repayment of the larger amounts are fifty, forty, and thirty years from the date of borrowing, and for the costs of the Order five years from its commencement. [*Parliamentary Agents: Messrs. Beveridge, Greig, and Co.*]

The Edinburgh and District Water Trustees require confirmation of the construction of certain specified existing works, and authority to carry out others, comprising a well, a service tank, filters, a pure-water tank, and eight conduits or pipe-lines, to be completed within ten years. The Order contains provisions in regard to the compensation water to be furnished to the Glencorse Burn and also as to the user of the Glencorse reservoir. The limits for the supply of water are the city of Edinburgh and the town of Leith (including the port), and certain parishes named, in so far as any of them are not already included in the city and town. The Trustees are to estimate the amount required annually to defray the cost of supplying water, and, at a meeting to be held on or before the last Monday in September, fix the domestic water-rate accordingly. The price of water for shipping is not to exceed 1s. 6d. per 224 gallons; and the public water-rate must not be more than 2d. in the pound on the annual value of the lands and heritages assessed. Unoccupied premises may be assessed; but certain specified public buildings are exempt. The water-rates are to be regulated so as not to exceed the expenses. In assessing the public water-rate, the annual value of (*inter alia*) all the underground gas and water pipes or works of any body supplying gas or water is to be, as nearly as possible, one-fourth. The Trustees require authority to borrow for the general purposes of the Order a sum not exceeding £100,000, and the further amount required for defraying the expenses incidental to obtaining it. They also wish to be empowered to raise money on short loans, and to grant allowances to officials retiring. [*Parliamentary Agents: Messrs. Beveridge, Greig, and Co.*]

The Order applied for by the Glasgow Corporation is to empower them to construct works consisting of a dam or embankment for enlarging Lochs Voil and Doine, forming them into a reservoir, and raising their water-level; an aqueduct to convey the water from the new reservoir to Loch Katrine; two new roads; a line of railway, nearly two miles long, commencing by a junction with the Callender and Oban Railway at the Kingshouse Station; and a diversion and alteration of the Kirkton Burn. Ten years are required for the completion of these works; and the Corporation apply for authority to provide accommodation for the workmen employed in their construction. Borrowing powers to an amount not exceeding £1,200,000 are applied for, in addition to the £4,300,000 already sanctioned by the Corporation Water Acts. [*Parliamentary Agents: Messrs. Martin and Co.*]

POINTS IN COKE-OVEN PRACTICE.

By G. E. Foxwell.

In any manufacturing industry, the main point to be borne in mind is that the article produced must be saleable. The coking industry is no exception to this rule. It is subject to the same laws of supply and demand which govern the rest of the manufacturing world; and unless the coke maker produces coke possessing the qualities which the metallurgist wants, his coke will be unsaleable.

The essential qualities of a metallurgical coke are three. It must be hard; it must be porous; it must not contain an excessive amount of impurities. When used in a blast-furnace, coke has to support a tremendous weight of ore, and, if not hard, will crumble under the strain, thereby causing the furnace to become choked up, with consequent stoppage of the blast. Moreover, a soft, friable coke will burn away very rapidly, even without the aid of the blast. This is undesirable, partly because it causes intense local heating owing to the rapidity of combustion, and does not distribute the heat evenly, and partly owing to the greatly increased fuel consumption. Porosity is necessary owing to the larger amount of surface area which is thereby presented to the blast. Without porosity the metallurgical operation in the blast-furnace is much prolonged, and it is difficult to maintain a sufficiently high temperature.

The most objectionable impurities met with in coal are sulphur, phosphorus, and ash. Sulphur is objectionable as it produces what is known as "red shortness" in the iron, making it brittle when hot. In a good metallurgical coke, the sulphur content should not exceed 1 per cent. Sulphur is found in coal mainly in three forms—organic sulphur, pyrites, and gypsum ($CaSO_4$). Organically combined sulphur and pyrites are partially volatilized on coking; while that present as gypsum remains in the ash. The greater part of the sulphur, comprising pyrites and gypsum, can only be eliminated by washing, though a small portion is driven off as sulphuretted hydrogen during quenching. The amount of the latter, though small, is often sufficient to cause the smell of H_2S to be quite noticeable. By these means a coal containing a high percentage of sulphur will often have its sulphur so far eliminated as to leave little over 1 per cent. in the coke.

Phosphorus only occurs in small quantities in coal, and is mainly contained in the ash in the form of phosphates. It is not volatilized on coking, and can only be removed by washing. If more than about 0·03 per cent. is present in the coke, "cold shortness" is produced—that is to say, the iron is brittle when cold. The ash, which should not be much over 10 per cent., is mainly undesirable, as it requires a large amount of flux to remove it. Moreover, with a high ash content, the purchaser will be paying the same price for ash as for coke. If the coke is to contain 10 per cent. of ash, the coal as charged into the oven should only contain about 6 per cent. The only way to reduce the ash is by washing.

From the above remarks, it will be seen that one of the most important pieces of apparatus on a coke-oven plant is the coal washery. Where the coal is compressed, the necessary moisture is added during the process of washing. If too little water is added, the cake will not hold together; while if the moisture content be excessive, the time of coking will be lengthened unduly. Generally speaking, compressed coal should contain 9 to 10 per cent. of moisture; but 12 to 14 per cent. is often met with. It is clear, then, that the washery should be kept under as careful laboratory control as any other part of the plant. The quantity of ash and moisture in the coal charged into the ovens should be determined every day. The amount of salt in the coal before and after washing and in the washing water should also be frequently determined. The water will wash out more and more salt, until finally a point is reached when the water holds so much salt in solution that it actually adds to the salt content of the coal. The derogatory effect of salt on the fire-brick material of the ovens is too well known to need further comment. Should the salt content of the water become too high, it must be diluted considerably with salt-free water, or replaced by a fresh lot. The point when this is necessary is determined by noting when the salt content of the coal is not appreciably lessened. The determination of salt in the water should be made as a check to ensure that the trouble is really due to the water and not to any outside source.

The question of the purity of the coke is entirely one of efficient washing; but hardness and porosity are directly dependent on the conditions obtaining in the oven during the coking process. When a coking coal is heated in the oven, it becomes partially liquid—probably owing to the liquifaction of the resin bodies—and presents a boiling appearance. This phenomenon is caused by bubbles of gas rising through the coking mass. If the mass is not too fluid, the holes will not completely close again; and a coke having the proper degree of hardness and porosity will result. If, however, the mass is too fluid, and the gas comes off too quickly—two phenomena which must occur side by side, being due to the same cause—one of two things will happen; either the holes will close up, giving a coke with little or no porosity, or the cells will be very inflated. In the latter case, the cell walls will be too weak, and an easily crushable coke will be produced. The rate at which the gas is evolved, and also the fluidity of the mass in the oven, depends on the temperature employed for carbonization. Too high a temperature results in too rapid evolution of gas. It is clear, then, that for the production of the best type of coke careful supervision of the temperature employed is necessary; and this temperature must be regulated to suit the class of coal employed.

To completely decompose coal a temperature of about 800° to 850° C. is necessary. This, therefore, is the lowest permissible. If the volatile matter is allowed to come off with a rush at the beginning, as mentioned above, the mass will be too fluid, and either a non-porous or weak-walled coke will result. The temperature, then, must be so regulated that a steady stream of volatile matter is evolved during as much of the carbonizing period as possible. It is the usual practice to keep the temperature in the heating flues more or less constant during the whole of the coking time; but in view of the above considerations, this seems a mistake. It would appear better to start with a somewhat lower temperature than that usually employed, and to increase it by degrees, reaching a high temperature at the end to harden the coke.

The hardness of the coke is also dependent on the deposition of carbon on the cell walls; this being brought about by the decomposition of the hydrocarbon vapours on coming into contact with highly-heated surfaces. The longer the vapours are in contact with the hot coke, the more complete will be their decomposition and, consequently, the harder the coke. It seems in some cases, therefore, advisable to work with a slight pressure in the oven-chamber, instead of a suction as is usual. This will, of course, increase the amount of the products of distillation which find their way into the heating flues; and it cannot be recommended for adoption where a good coke is produced without the necessity for special precautions. But in the case of a coal which only gives a moderate quality of coke, it seems desirable to sacrifice a certain proportion of the bye-products in order to obtain a better coke.

Midland Association of Gas Managers.—The Hon. Secretary of the Association (Mr. W. G. S. Cranmer, of Willenhall) informs us that the annual general meeting will be held at the Grand Hotel, Birmingham, on Thursday, the 26th inst.

THE CONSOLIDATED (NEW YORK) GAS COMPANY'S NEW BUILDING.

A Remarkable Structure.

REFERENCE has been made in the "JOURNAL" on several occasions to the gigantic new building of the Consolidated Gas Company of New York; and in the issue for the 16th of December last we gave some particulars of its construction and equipment. We are now in a position, through the courtesy of Mr. HERBERT W. ALRICH, one of the engineering staff of the Company, who made the designs for the foundations and structural steelwork, to furnish a number of additional details, with views, of this remarkable building, which is probably the largest in the world devoted to the business of gas supply. For the text, we are to a large extent indebted to an article in "Engineering News" (New York), which was prepared under Mr. Alrich's immediate supervision.

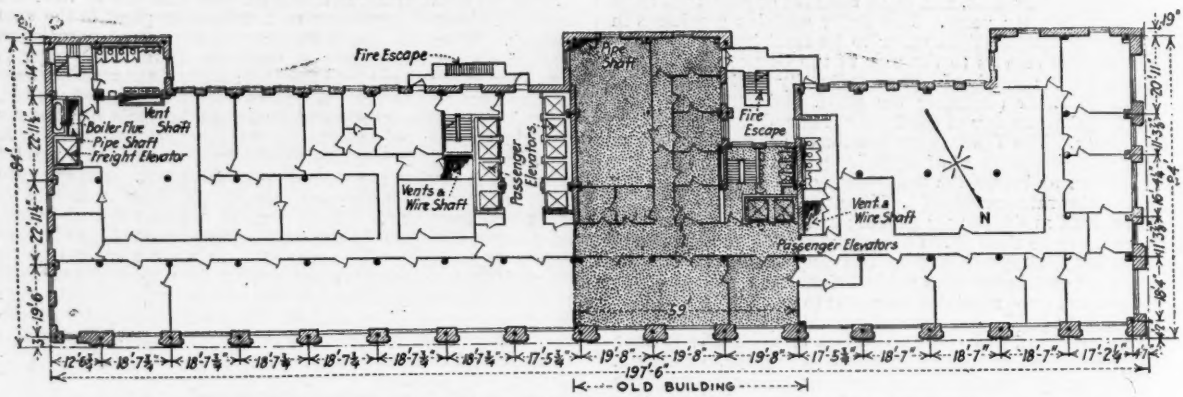
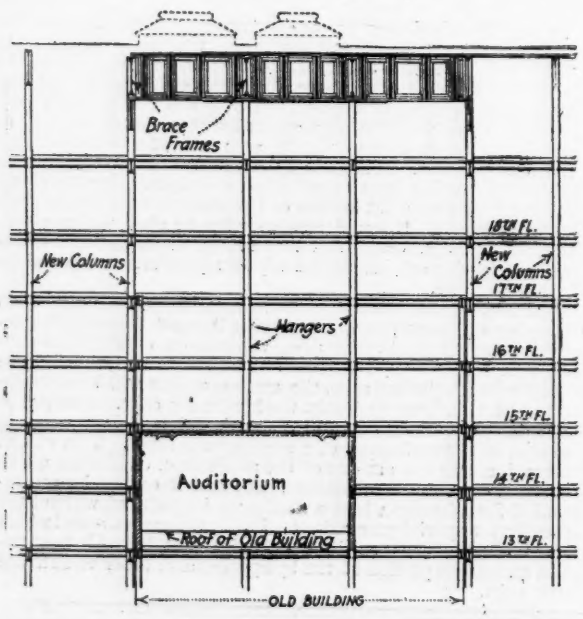


Fig. 1.—TYPICAL FLOOR PLAN OF THE CONSOLIDATED GAS COMPANY'S BUILDING.

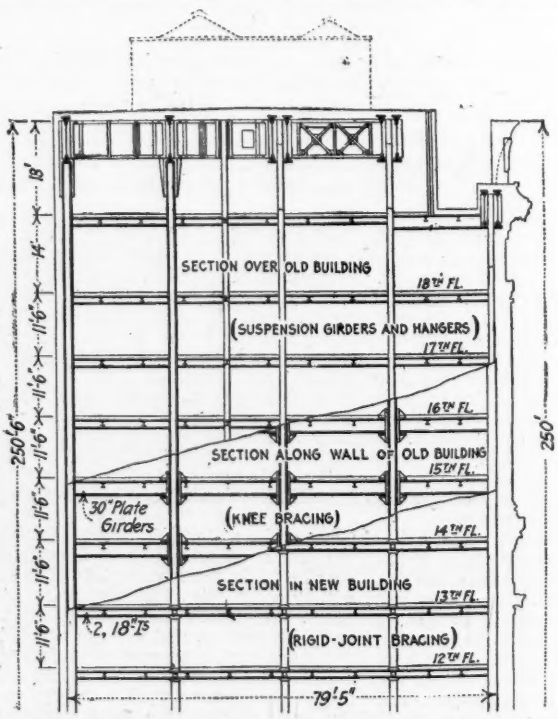
INTRODUCTORY.

Before giving any structural details of the building, it may be of interest to review briefly the circumstances which led to its erection. A predecessor of the Consolidated Gas Company, in 1855, put up a small four-storey building on the corner of Irving Place and Fifteenth Street, New York. Some years afterwards, three adjoining buildings were acquired; and the original site, measuring 60 ft. by 90 ft., was enlarged to 84 ft. by 155 ft. This was the condition of things about three years ago, when the offices had spread through the original structure and the transformed residences adjoining, and the Company had definitely planned a new building. It was decided that the required office space called for a twelve-storey building on the available plot of ground; and the course adopted to provide it was to build first the eastern portion, transfer the offices into it, then take down the abandoned buildings and construct the western portion. The first section of the work was started in the autumn of 1910, and was finished by July 1, 1911. It is the part marked "Old Building" in the accompanying plan (fig. 1).

When the offices had been removed, and the remaining old buildings had been vacated and were ready for demolition, new conditions arose, and work was stopped pending the preparation of new plans. Several plots lying east of the Company's ground were acquired, giving a total length east and west along Fifteenth Street of 297 ft. 6 in.; thus nearly doubling the ground area of the site. With this enlarged site in their possession, the Company decided that the new building should house not only their own offices, but also those of all affiliated and subsidiary companies; the total requiring about three times the space hitherto reckoned upon. Revising the space estimate on this basis gave the result that a new building on the entire enlarged plot of ground would have to be eighteen storeys high. This height was adopted, and the building has been erected accordingly, except that a roof-house, which is virtually a nineteenth storey, was added for accommodating an employees' restaurant and the officials' dining-rooms. There are also three extensive penthouses above this storey for enclosing tanks and elevator, ventilating, and other machinery. The preparation of plans for the new building was commenced in the autumn of 1912, and the contractors began work in the spring of last year. It is expected that the building

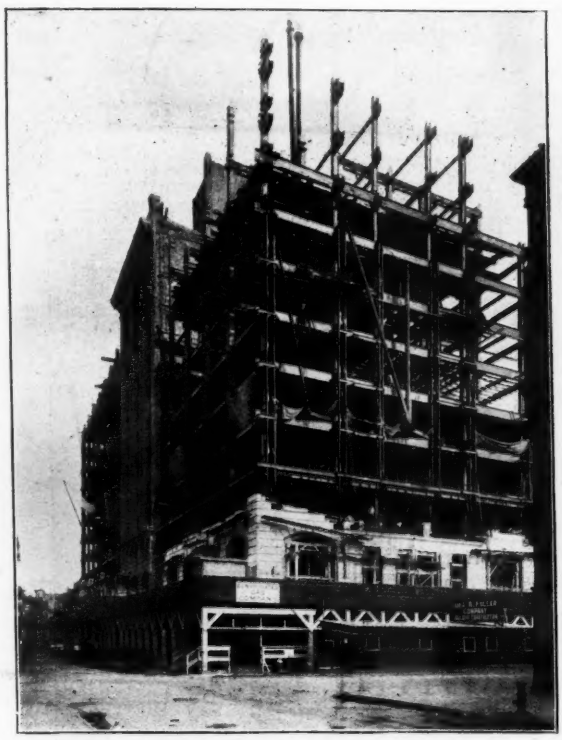


Part East-West Section.



North-South Section, showing Wind-Bracing.

Figs. 2 and 3.—SECTIONS OF THE CONSOLIDATED GAS COMPANY'S BUILDING.



Photograph A.—The Building as on June 20, 1913.

will be ready early this spring; the structural parts having been completed and the finishing work being in progress at the close of December.

The New Building.

The steel framework of the old building was not strong enough to carry any additional height, and this required that new supports should be provided for the six-storey section above it. To place a new column alongside each of the old columns through the floors and storeys of the old building, or to increase the cross-section of the old columns, would either permanently obstruct the floors, or require extensive alterations to the existing steelwork. It would have meant, in effect, vacating the old building, at serious inconvenience to the Company, whose officers would have to find temporary quarters for a year. Therefore the scheme of spanning the space above the old building by girders or trusses was resorted to. Of the various ways of applying this scheme, the one adopted has the merit of leaving quite unobstructed the interior space of the seven added storeys, while other ways would have involved obstruction.

The east-west section (fig. 2), which is a part longitudinal section of the new building, and at the same time a transverse section of the old one, shows the general arrangement of this girder-and-hanger structure. There are eight girders, as may be seen from the north-south section (fig. 3). The two rear girders are short, while the six forward ones are considerably longer and in pairs. The pair in the plane of the front wall (carrying the front wall but only half a floor panel) is not so heavily loaded as the two at the back of it. The second and third pairs are the heaviest.

Referring to the north-south section, which is a transverse section of the new building, it will be seen that the front girders are at a lower level than the others. This is because the nineteenth storey is set back from the front wall by the width of a walkway on the roof at the back of the main cornice. The other girders are above the ceiling of this storey, and enclosed in the space between the ceiling and the roof—a space resulting from the depth of trusses used to support the roof over the new portions of the building, interior columns being omitted to obtain clear floor space in the dining-rooms. Consequently the placing of the plate girders above the nineteenth storey does not increase the height of the structure or entail an unsightly projection above the general skyline of the building.

The storey immediately above the roof of the old building contains neither columns nor hangers. Advantage was taken of this to construct there a large auditorium or lecture hall, occupying the width and length of the old building. Because the hangers of the upper part of the building are thus left without the stiffening which would be realized if they were continuous with the columns below, they are provided with a set of horizontal crossed diagonals at their lower ends, the fourteenth floor—*i.e.*, the level of the ceiling of the lecture hall.

The girders are 8 ft. 4 in. deep, and, on account of the great loads and bending moments involved, are in pairs, consisting of two I-sections side by side. The details of special interest are the end connections and the hanger connections; the former involving the use of immense tapering gusset-plates. This connection was designed to avoid eccentricity, and is believed to distribute the load over the full column section quite equally because of the great depth of the gusset-plate. This is a substitute for, and continues, the centre web-plate of the column. The hanger section and the connection of hanger to girders is simple, and assures a direct and central transfer of load. The connections of the floors to the hangers are normal and central, except at one or two special points.

The foundations of the building are on rock. The site has rock so near the surface that the point of deepest excavation for footings was not more than 10 feet below the cellar level.

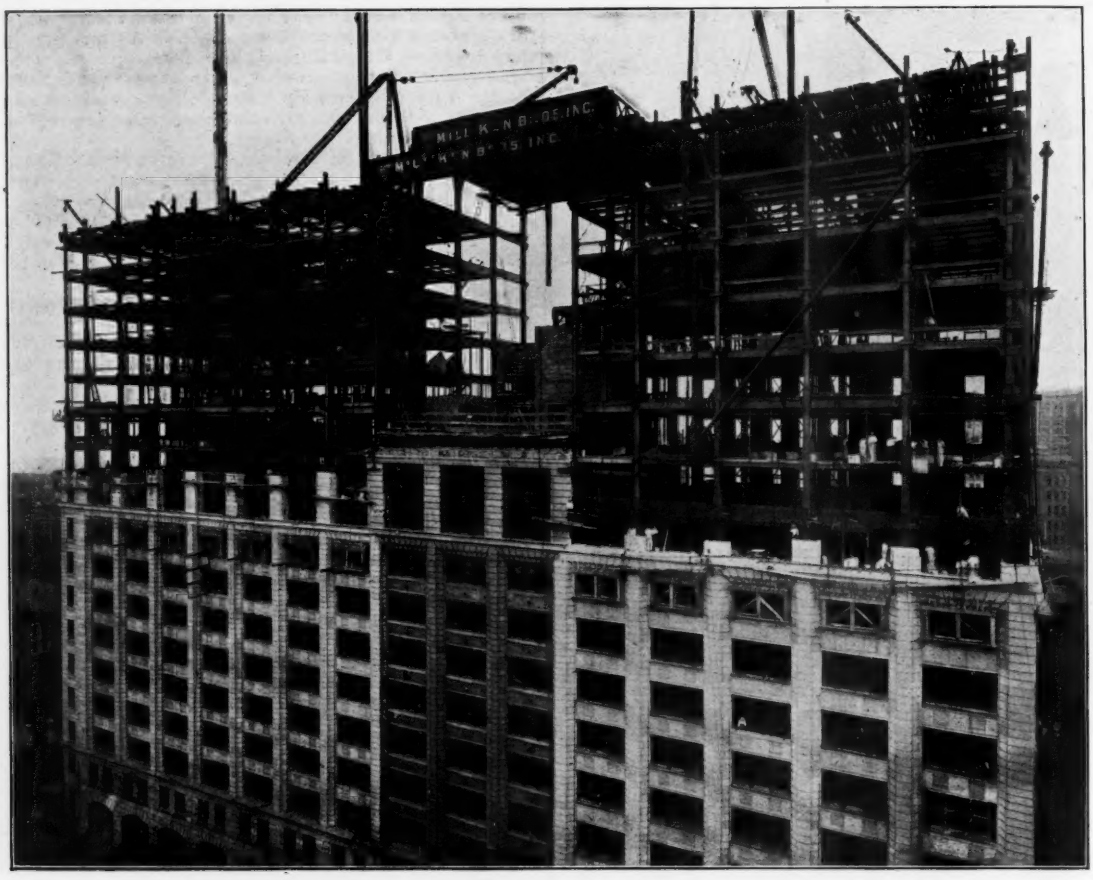
Front-Wall Framing.—The long Fifteenth Street front, detailed to match the architecture of the front of the original twelve-storey building, is simpler than the Irving Place front, and required fewer special features for the steel design. The latter front, however, is not only provided with a high portal and entrance lobby, but has wide projecting belt-courses and recessed storeys in irregular alternation, with the general result that the front row of main columns had to be set about 5 feet back from the property line, to clear the recessed work; and special arrangements had to be devised for carrying the stonework, and some floor load, in front of this line. The special framing for this purpose consists of what is really a cantilever truss, composed of a line of wall columns 3 ft. 6 in. in front of the main columns, and downwardly inclined hangers from the main columns supporting these wall-columns, in connection with struts at the floor levels to complete the truss. The spandrel beams, and the special supporting beams for the belt courses where necessary, are attached to the wall-columns or to the struts at the floor level in various arrangements as required by the overhang of the stonework. A special column arrangement was required at the large portal occupying the centre of the Irving Place front.

General Framing.—The general framing involves the rigid-joint type of beam-and-column connection as wind-bracing in the north-south direction. All the floor-beams running north and south between the columns are double, and pass outside the column—being riveted to them with a group of rivets having sufficient moment capacity to resist the distorting moments due to wind-pressure. The subsidiary joists run east and west, and are framed into the double beams.

The general panel dimensions are 20 feet north-south by 18 feet east-west. The floor joists are on the average spaced about 6 feet apart, carrying a cinder-concrete floor-slab of this span. There are no cross walls in the building for its entire length of 297 feet, except the remains of the east and west walls of the old building, as indicated in the typical floor plan (fig. 1). The stiffening effect is therefore due entirely to the wind-bracing. This includes, beside the floor-beam connections, four lines of special wind girders in the front or west wall, the east wall, and along the sides of the old building. Here 30-inch plate girders are used in place of the regular double floor-beams, with enlarged gusset-plates forming knee or bracket connections. Horizontal diagonal bracing is introduced at several points of the structure, to give rigidity against unusual forces or conditions.

Cornice Framing.—A special feature of the framing is found in the structure of the main cornice. This comprises a moulded copper projection about 5 feet wide, and upon it a series of copper ornaments 8 feet high. It is supported by steel channel

Photograph B.—East Wall under Construction on July 23, 1913.



PHOTOGRAPH C.—THE FIFTEENTH STREET FRONT OF THE BUILDING ON AUG. 4, 1913.

and angle framing, carried at each column by a rectangular trussed bracket; the columns projecting about 3 feet above the beams of the nineteenth tier, to provide support for the brackets. The resulting bending moment in the columns (especially with regard to wind-pressure against the copper ornaments) is absorbed by the nineteenth tier floor-beams framed to the columns, in the north bay, in place of the double channels used elsewhere.

Photograph D.—The Building practically finished on Oct. 28, 1913.

Design of Steel.—The framework and floor slabs were proportioned for a live load of 120 lbs. per square foot on all floors. The wind-bracing was proportioned more by judgment than as the result of definite calculation on the basis of any artificial assumption, though such calculations were made, on various sets of assumptions, with the result of showing the structure to be amply rigid, with excess.

Other Features.—The walls of the building are of brick. The front walls are faced with limestone to their full height. The other two exterior walls are plain brick, with panelling of darker coloured brick to relieve their bareness. The floors are 5-inch reinforced (triangle-mesh) cinder concrete slabs, 5 to 6 feet span, with 2 inches of lean cinder concrete filling above, in which the pipes and wires are embedded, topped off with a 1-inch cement-mortar surfacing. The interior partitions consist generally of 4-inch terra-cotta, held by the pressed-steel framing of the doors and other openings. All exterior doors, sashes, and frames will be of hollow steel; those in the rear wall of hollow copper; and those in the front of bronze-covered wood. The staircases, of which there are two—one at the east end and the other at the centre of the building—are built with marble platforms and treads on steel stringers and risers.

Ample provision is made for the supply of water and steam, for the ventilation of the building, and for the escape of occupants in case of fire.

Special decorative lighting has been planned for the exterior of the building. This includes cast-iron frames or edgings and spandrel panels set in all the window embrasures above the fourteenth floor, containing electric incandescent lamps in the recesses of the frame; cornice lamps and groups of lamps in the elements of the copper projection above the cornice; straight lines of border lamps in the window panels below the fourteenth storey; and two gas-torches on the roof.

There are various other interesting items in the equipment of the building. For example, the arrangement of gas, electric, and signalling distribution for extra purposes is worth notice. In each room there is a brass floor-plate with outlets for four services —gas, electric light current, telephone wires, and bell or signal wires. The outlets are contained in a four-compartment iron box covered by the floor-plate; and screw plugs in the plate give access to the outlets. The telephone wires and the lighting wires in the floor-plates are for special use only. The general telephone wiring is carried in the picture moulding; and the electric light wires to the permanent ceiling fixtures are in steel conduit embedded in the concrete filling of the floors.

The architectural design of the Irving Place and Fifteenth Street fronts was the work of Mr. H. J. Hardenbergh. With this

exception, the building was designed and erected under somewhat unusual circumstances, in that all the other engineering, designing, and supervision was performed by the Engineering Department of the Gas Company—Mr. W. H. Bradley, being Chief Engineer, and Mr. W. W. Cullen Morris the Engineer of Construction.

As stated at the outset, the designs for the foundations and structural steel, including the large girders and other special structural features which have been described, were made by Mr. Herbert W. Alrich, a member of the engineering staff. The general contractors for the entire building were the George A. Fuller Company; and Messrs. Milliken Bros. were the contractors for the steelwork.

The Photographs.

The preceding details may be supplemented by a few remarks on the accompanying series of photographs, which show the progress of the building.

Photograph A was taken on June 20, 1913. It shows a portion of the special framing required for the support of the massive architectural features of the Irving Place front of the building.

Photograph B was taken on the 23rd of July. It shows the east wall of the building under construction. The masons work on a scaffold suspended by steel cables; the scaffolding being raised as the work proceeds upward. The wall is carried at the level of each floor by the plate girders shown. The strength of these girders is in excess of that required for the support of the masonry, as they perform the further function of stiffening the building against wind-pressure.

Photograph C was taken on the 4th of August. It shows the Fifteenth Street front of the building, with all the large girders in position. It will be noted that one hanger, shown extending downward from the girders, has been partially erected. To the extreme right of the picture there is shown, in complete detail, the framework for the support of the heavy masonry on the Irving Place front.

Photograph D was taken on the 28th of October. It shows the building in a nearly finished condition—the cornice being incomplete.

GASEOUS COMBUSTION.

Concluding Lecture by Mr. Tooth.

The last of the series of three lectures on "Gaseous Combustion" which Mr. L. F. Tooth (of the Commercial Gas Company) has been giving at the Westminster Technical Institute, Vincent Square, was delivered on Friday evening. There was again a good attendance; and much interest was taken in the practical demonstration with which the proceedings concluded.

In opening, Mr. Tooth considered the application and uses of oven-furnaces, which, he said, may be divided into two classes—open hearth and close muffle. The former are employed in connection with tempering, case hardening, and commercial enamelling; while the closed muffle is generally used for high-class enamel work, and for other purposes where it is necessary to ensure that products of combustion do not come in contact with the work in hand. Tempering of steel is a most delicate and important operation. For best high-speed or fine-edge cutting steel, the temperature to which the metal is subjected is fixed in accordance with the particular firm's method of production. The process is to expose the metal to a given temperature for a certain length of time, afterwards allowing it to cool down in a non-oxidizing atmosphere, which is accomplished by closing all the air-inlets, and the flues, by means of dampers. The steel is then allowed to cool down within the non-oxidizing area for as long as may be desired. Low-pressure under-fired furnaces are generally considered preferable for obtaining saturated or soaking heats; but high-pressure gas is equally suitable, providing that the design of the furnace permits of equal combustion and heat distribution. For this purpose furnaces fired from the sides are preferable with high pressure.

With regard to lead and other low-temperature metals, it was pointed out that these are generally treated in iron or steel pots, and in greater bulk than metals of higher melting-point. Thus a burner consuming large volumes of gas in one flame is too concentrated or localized, and it is necessary to employ burners with a number of ignition-points covering a larger area. Wherever large surfaces are to be heated to a low temperature, ring or bar burners are recommended. For melting lead and other metals of a bulky and heavy nature, gaseous heating is often more costly than solid fuel, because of the heavy brickwork and solidity of furnace construction which are called for. But in spite of this, as the lecturer went on to remark, gas has many compensating advantages. In some methods of working, the quantity of metal ladled out is replaced from time to time, thus reducing the temperature; and for this purpose gas has many points in its favour—particularly when the temperatures are governed or maintained by pressure. As an example, he quoted the following: Assuming a 34 cwt. pot of lead is required to be melted and maintained at a temperature of 900° C., this quantity of metal can be reduced in 1½ hours for a consumption of 480 cubic feet of gas at 5 lbs. pressure, and afterwards maintained at this temperature with a consumption of from 150 to 200 cubic feet per hour at a pressure of from 2½ to 3½ lbs. Duplex burners or a series of burners for firing lead-pots, he does not find so economical. It is necessary to employ high-pressure gas or air-pressure burners to obtain melting costs equal or thereabouts to solid fuel; and the high velocity of flame which the combustible mixture under pressure produces, and what might be termed forced draught, renders a combustion space that is suitably provided for a given volume of secondary air induced by the flame velocity at a certain pressure equally suitable for the combustion of a lesser volume at a lower pressure—which means reduced flame velocity, and so the automatic control of the secondary air. With duplex burners, the shutting-off of one-half would not regulate the entrance of secondary air, as the flame velocity would be the same, though reduced in volume. An excess of air for combustion would thus pass into a combustion space designed for a greater volume of gaseous mixture.

In firing all large areas and open pan boiling or blending furnaces, Mr. Tooth has found that the best results are obtained by causing the tip of the flame to impinge upon the base of the vessel containing the material; the flame afterwards being diverted upwardly between the brick-lined walls and the side of the pan or vessel in use. The products of combustion then pass into a series of outlets which communicate into downward flues, thus reheating the brickwork.

There was then thrown on the screen a slide showing comparative results of coke and gas-fired furnace workings in a brass foundry. The following are the figures given.

Comparative Results in Brass Foundry.

—	Coke Fired.	Gas Fired.
Size of pots	60 lbs.	40-50 lbs.
Number of charges per day per furnace (9 hours)	5	8
Weight of metal melted per day	300 lbs.	355 lbs.
Time of first heat	1½-2 hours.	50 mins.
Time of subsequent heats, average	50 min.	26 min.
Fuel used per day	2¼ cwt.	706 cubic feet.
Price of fuel (gas includes cost of compression)	11d. per cwt.	1s. 11d. per 1000 c.ft.
Total cost of fuel	2s. 3½d.	1s. 3·2d.
Cost of labour for fireman	1s.	*Nil.*
Cost of metal melted	1s. 2·6d. per cwt.	4·91d. per cwt.
Average life of pots	30 months.	40-45 months.

Slides of different furnaces were next shown and the working of them explained. These included Mr. Tooth's sugar boiler, which has already been illustrated and described in the "Journal." A short description of the system of surface combustion followed; this also being accompanied by a number of photographs. In connection with this matter, some remarks were made on the subject of porous-brick making. The actual process by which the Bonecourt porous diaphragms are made the lecturer confessed his inability to state; but he said that grog, or grit, which is ground into small particles from good fire-brick, can be mixed in proportions of three of grog to two of clay and one of sawdust, into a plastic state, and then moulded, dried (preferably wind dried), and fired in a kiln. The higher the temperature at which the brick is fired, the less porous it becomes. Other ingredients than sawdust are used; rape seed being more commonly employed. For clays in which excessive contraction takes place, and where extreme porosity is required, Indian maize can be used. The manufacture of refractory materials of a porous nature which are required to withstand the exceedingly high temperatures developed by the Bonecourt system presents many difficulties, as it is absolutely necessary for all contraction to be taken out of the clay before being put into use. Should there be any leakage of the combustible mixture through breakage of the diaphragm, or any opening in the chamber due to unequal expansion or contraction of the combined materials, the principle of the system would be destroyed. Thus they would readily understand the many difficulties which must have been overcome in bringing it to a successful issue.

Other slides having been shown, of installations of different types of furnaces, the audience accompanied Mr. Tooth to the fitters' workshop in the basement of the building, where a gas-fired furnace was in actual operation. They saw a 40 lb. charge of brass melted in twenty minutes, though it was only possible to get 5 lbs. pressure, instead of the 10 lbs. which is desirable. Gas was being consumed at the rate of about 190 cubic feet per hour. The furnace, it must be mentioned, had been running for three hours prior to the melt. A demonstration was given of the cutting of steel plates by an oxy-coal gas flame; the gas being under ordinary pressure. The results accomplished were on all hands agreed to be excellent. Those present were also able to take readings for themselves by a Féry pyrometer.

Mr. S. A. Carpenter (the President of the London and Southern District Junior Gas Association, by whom, in conjunction with the London County Council, the lectures had been arranged), in proposing a hearty vote of thanks to Mr. Tooth, said the lectures had been most satisfactory, and they would certainly try to fix up another series next session. Mr. Tooth had given them the results of his own practical research and study. He had met with many difficulties; and he had been good enough to tell them how he had got over them. Upon everything he took up he brought to bear enthusiasm and great energy; and this particular subject had been quite a hobby with him. The Commercial Gas Company

had taken up the matter, and were now doing a big business in the use of gas for industrial purposes. High-pressure gas had rendered this fuel suitable for many more processes than before. Their thanks were due to Mr. Tooth not only for the lectures, but for the aid he had given to the gas industry in making it possible for more gas to be used.

Mr. Ernest Scears, in seconding the vote (which was cordially passed), remarked that Mr. Tooth had done a tremendous amount of work in this direction, and proved himself an expert in the construction of furnaces and burners; and the personal element he had been able to introduce had added greatly to the value of the lectures. He had stimulated their interest in this important subject, and had shown them plainly the great progress which had been made.

Mr. Tooth briefly acknowledged the vote; assuring them that any information which he obtained as the result of work done by him he was always only too pleased to impart to others.

CHAMBER RETORTS OF A NEW SHAPE.

The "American Gaslight Journal" for the 2nd inst. contains particulars of a large silica retort of a new shape which is being brought out by the Gas Machinery Company of Cleveland, Ohio. It is shown in the accompanying illustrations, in which figs. 1, 2, and 3 represent an arrangement for an inclined chamber setting, and figs. 4 and 5 a horizontal setting, with a combination coal-charging and coke-pushing machine at one end, and a coke-quenching car at the other.

It is claimed for the retort that it will hold 50 per cent. more coal than one of the customary shape. Ordinary Ω retorts will hold from 50 lbs. to 70 lbs. of coal per lineal foot; but the new chamber retorts can be charged with from 100 lbs. to 110 lbs. A smaller number will consequently be required to perform the same amount of work; and as the coal is carbonized in greater bulk, a much harder coke is produced. These chamber retorts must not be confounded with chamber ovens, since in the latter the saddle blocks or bricks between adjoining ovens form part of the wall; whereas with chamber retorts they surround and support the retorts, as is customary with the Ω-shaped kind. The furnaces are at the charging end of the benches when they are to be fed with coal or small coke; but they can be located at the discharging end. Stepped grates are shown; but horizontal or rocking grates, or separate producers, may be used instead. A dry collecting main may be installed instead of a hydraulic main; and superimposed retorts may have one ascension pipe in common. Benches with chamber retorts may contain whatever number of these will best suit local conditions.

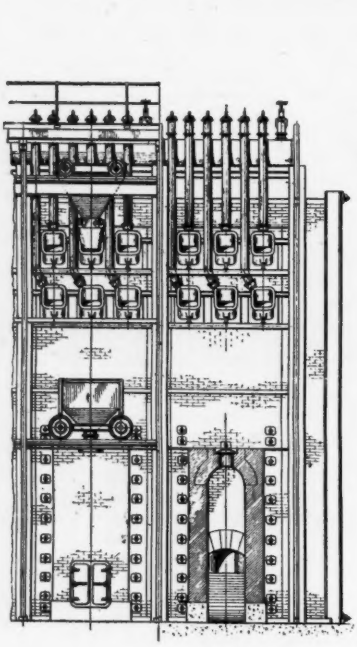


Fig. 1.

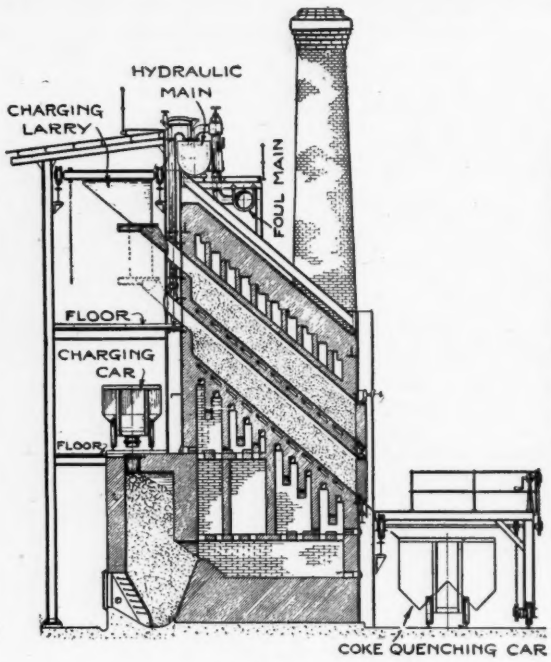


Fig. 2.

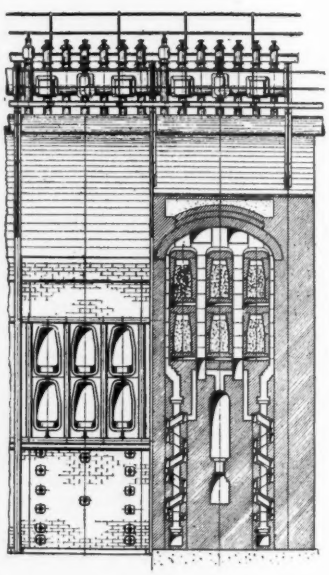


Fig. 3.

INCLINED CHAMBER INSTALLATION.

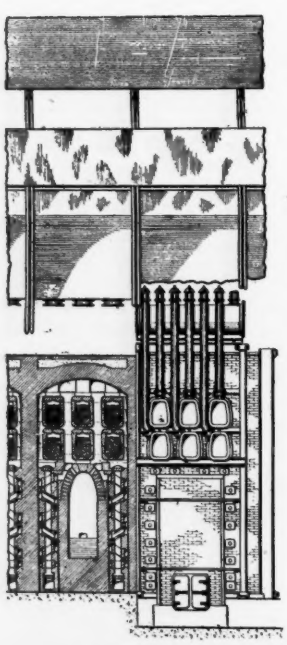


Fig. 4.

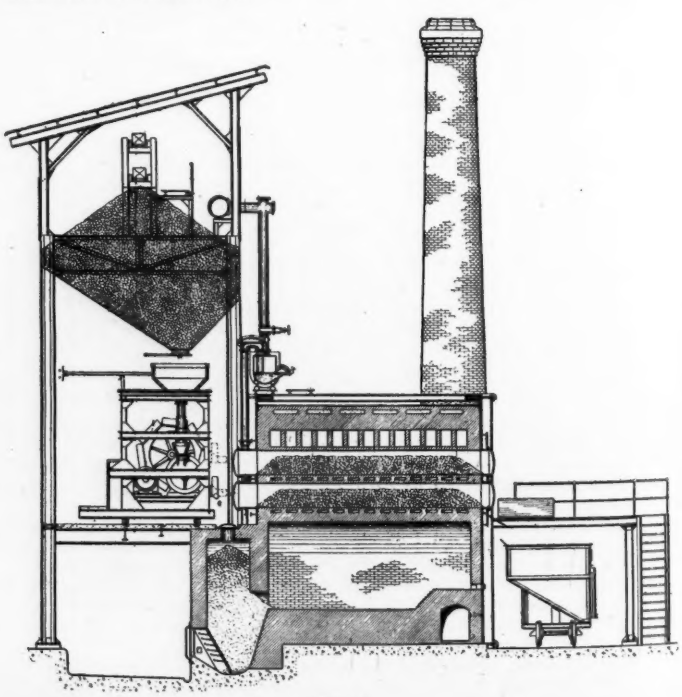


Fig. 5.

HORIZONTAL CHAMBER-RETORT INSTALLATION, WITH CHARGING AND COKE-PUSHING MACHINE.

EDUCATION IN THE GAS INDUSTRY.

By F. J. Bywater, of London.

[An Address to the Midland Junior Gas Association, Feb. 14.]

Mr. President and Gentlemen,—It would be only courteous for me to thank you most heartily for your invitation to come here to-night to speak to you on the occasion of your annual dinner. But I should be a very commonplace individual indeed if I did not feel this invitation to be something out of the ordinary, and for reasons which I think that you will readily understand. I was born in the Midlands, was educated, trained, and spent many years of my life in Birmingham. As you know, I took some small share in founding, or rather assisting at the birth of, this Association, and to be invited by you now to return for a short while on an occasion like this is indeed very gratifying to me; and I desire to thank you Mr. President and your Council, and all the members, most sincerely for the honour done me.

Progress of the Association.

Before turning to the subject of my address to you, I should like to congratulate you all very heartily indeed on the splendid progress the Association has made. Our friends Mr. Berridge, who was then President of the Midland Senior Association, and Mr. Chas. Meiklejohn, then Secretary, nine years ago invited some of the young members of the gas profession in the Midlands to attend a meeting to consider the formation of this Association. I am sure the progress you have made, the good work you have done, the excellent papers you obtain, and the keenness which has been revealed in the intervening years, must be indeed gratifying to them; and for myself, I can only say that I am very proud to have been your first President. I would urge you to continue as you are doing now—seeking out and persuading those who are intimately engaged in the work of the industry, and particularly those who are working out some of its problems, to come to your meetings and give you the benefit of their knowledge and experience. In doing this, you are rendering a very real service to the gas industry; and, at the same time, doing yourselves inestimable good.

A Definite Scheme of Education.

The Junior Associations have supplied a great want, and their influence and status are increasing every year. But there is one very great want still unsupplied to the Junior members of this great industry—a want which many of you, in common with, I think, the great majority of your Seniors, know to be a very real one, and one which I dare venture to say has been experienced by almost every one of you, certainly I should say by 95 per cent. of you, for that is not too high a figure at which to estimate those who desire to get on, and have the very proper and laudable ambition to occupy one day a position of responsibility and trust—I refer to the lack of a definite scheme of education for those about to enter, or who have just entered, the profession of gas engineering. I have not now in my mind those who have had, or will have, the advantage of a well-thought-out scheme of education before they come to the industry—such as can now be obtained at the University of Leeds—or those who, after receiving a good training at a Technical College, are articled to a first-class engineer, who makes their subsequent training and education his care. Unfortunately, these can only be a small proportion of the whole. I refer rather to the great majority of young fellows, who, after receiving the usual education at the age of sixteen or seventeen, find themselves in the industry as a means of earning their living. These young men come to us with a more or less good preliminary education, and in many cases with a keen desire to fill in the gaps of this by energetically trying to equip themselves for the future.

But what do they find when they turn their attention to doing this—absolute chaos and uncertainty! In very many cases their studies used to begin and end in the classes for gas manufacture and supply; and although matters are perhaps somewhat better now, the unsatisfactory preliminary training of many of the students who take these classes has been repeatedly referred to—notably in the papers which Mr. Thomas Glover and Mr. J. H. Brearley read before the Institution of Gas Engineers in 1912. Other careful and observant examiners, such as Dr. Colman, Mr. W. Doig Gibb, and Mr. A. F. Browne, relate the same experience. The subject was also referred to by Mr. Bell in his address to you last year, and by Mr. Johns in his admirable presidential address a few months ago. But I feel so strongly that something should be done in this matter, that, at the risk of boring you, I am bringing it again to your notice to-night. I am doing so for a multitude of reasons; but chiefly: (1) Because, although a great many of you have already obtained a footing on the ladder, have shaped your careers, and have no need for a scheme of education to be provided for you, there must be many others who are still looking for a lead and assistance in their studies; and (2) because it is of vital importance to our industry that its young men should be trained and educated on a carefully prepared and well-thought-out plan. You, and those who come after you, are to be the leaders and administrators—in fact, more than that, the life-blood of progress in the future. If it is a fact, as I believe it is, that the class of young men I have indicated above, and whose case I am discussing, form the great majority of our young men, then I think it is of vital importance that this great want should be remedied at once. It is no use disguising the fact that, while the gas industry to-day occupies a position of magnificent strength, it is certain that the future will not only produce many claims for development and improvement from within, but also many assaults on its position from without; and it behoves us to take care that the young men who are coming into it daily go into the fight well-trained and well-educated.

And what are we doing at the present time to bring this about? I have already stated that the young student of gas engineering finds himself in a state of uncertainty and chaos when he looks round for guidance as to what work he should take up; and it is not very surprising that he first of all turns his attention to the theoretical side of gas manufacture and supply. Having done this for one or two years (and, it may be assumed, passed the examinations), he may wander about more or less aimlessly in his uncertainty as to which he should choose of the multitude of subjects he might appropriately study. He will probably take up for a time, and in a desultory manner, classes in chemistry, and various engineering subjects. Then (other attractions coming along) these efforts gradually become less, until they cease altogether; and the student has finished his education and training, except for such as he may obtain in the ordinary course of his work. This, in my opinion, is what has happened, and is happening now, in the case of hundreds of our young men. When one stops to think of it for a moment, and examine carefully what it means, we must see what an altogether inadequate preparation such a disjointed course of study must be for the equipment of men who will have to carry on and develop what is already a highly-technical industry, and promises to be far more so in the future. Think of it how you will, gas manufacture pure and simple is only a small portion of a gas engineer's duties, just as gas-fitting is of those concerned in supply. The modern gas engineer must have a thoroughly good knowledge of civil and mechanical engineering, in very many branches of which his work is intimately concerned; and equally important is it that he should be well versed in chemistry and physics. Whatever be the demands to-day in these subjects—and they are by no means light—I am sure they will be still more urgent in the future. Further, a knowledge of electrical engineering has become almost a necessity to us, and not only from the utilitarian point of view; for the injunction to "know thyself" should always in business include "know thy competitor." Lastly, but by no means least, it is extremely desirable that the young engineer should, in his early years of training, become acquainted with the first principles of accountancy and business methods, especially if he intends to aim at an executive position later on; for it always appears to me to be one of our great failings that we are apt, as engineers, to be continually bearing in mind the technical side of our work without remembering that very important feature "debit and credit." It is not necessary that every gas engineer should be a first-class accountant; but I do think that before his training can be considered complete, every young engineer should give some time to this subject.

In gas supply the demands are no less varied than are those connected with manufacture; and if during the next ten years advances are made equal to those of the past decade, the necessity for good technical knowledge and careful training will become absolutely essential. Those engaged in the supply of gas to the consumer have far more varied and exacting duties to perform now than was the case a few years ago. It will be sufficient to mention some of the present-day requirements to illustrate this. In addition to their duties connected with the distribution of gas and the equipment of the consumers' premises with service-pipes and fittings, &c., they must now thoroughly understand the economical development and transmission of light, heat, and power, and all the many intricate problems connected therewith. They must have a thoroughly good knowledge of electricity, the science of ventilation, and building construction, and also have a well-developed idea of what is artistically good and appropriate if the consumer is to be satisfied with the result of their labours.

During the last few years enormous strides have been made in the use of high-pressure gas and the generation of heat therefrom. How deeply interesting and technical this can be, those of you who are conversant with what is at the present time being done in Birmingham and elsewhere will quite understand. These are only some of the requirements of those who are engaged in the distribution and supply of gas; but they will suffice to show how very important this branch of our work has now become, and how essential it is that the greatest possible care should be taken in the training of those who are to be engaged in it. One might go on for a long time enumerating the many subjects with which those concerned with the manufacture and supply of gas ought to be well acquainted if they are to be thoroughly equipped for the future. It is perfectly obvious that, instead of leaving to chance things as they are at present, or the laborious and unguided effort of the individual student, there should be placed before him, quite early in his career, a settled course of study, which will first of all give him a grounding in the first principles of the essential subjects connected with his professional work, and also set before him more advanced courses in chemistry, engineering, or commercial subjects, which he may attempt later on.

How is this course of training to be obtained? The problem does not appear to me to present any very great difficulties. The first essential, of course, are the schools where such instruction can be readily obtained. They are already in existence. There are now held in every town in this country of even the most

moderate size all the classes which would provide the student with the instruction he will need in general subjects of engineering and chemistry, and probably the only one for which he will have to go any distance, or in the last resort fall back on correspondence, is "Gas Manufacture and Supply." But this should only be necessary in the smallest towns. The second essential are the men. This I am quite sure I am safe in taking for granted; for I do not think any industry can boast a set of junior members with greater enthusiasm and keenness than ours. If any proofs of this are required, the success achieved by the Junior Associations will suffice. The third necessity is the programme or scheme of education. How and by whom is this to be provided? There is one fundamentally sound economic law that "supply" and "demand" are closely interdependent; and in this case I think the "demand" must precede the "supply," and must come from the juniors themselves. Those who have felt the want of guidance and advice in their training and education, must ask for it.

The procedure which I would suggest to you is to carefully discuss the matter at the Joint Council Meeting of the Junior Associations which is held in the spring of each year; and then, if it is agreed to go on with it, to approach the Council of the Institution of Gas Engineers, and ask them to appoint a Committee for the purpose of considering the matter with your representatives and formulating the scheme. This is not a subject for one or two men to decide; it requires careful deliberation between those who want, and those who know how to supply—that is, between yourselves and a committee of engineers and managers who possess wide experience and good judgment. The President of the Institution of Gas Engineers (Mr. Edward Allen) is—if I may say so with respect—such a man; and his sympathy and kindly feeling towards the junior members of the profession are shown by the graceful compliment he has just paid them by inviting them to contribute a paper to be read at the annual meeting of the Institution in June next. I have no authority for saying so, but I am perfectly certain that a request to him and the Council of the Institution for assistance and guidance in such a matter as this will not fall on deaf ears; and having regard to what I have said about the importance of some kind of commercial training, I would suggest that the Council of the British Commercial Gas Association should be invited to assist in drawing up a part of the syllabus of study. The claims and requirements of the future can never be foreseen and met with a reasonable prospect of success unless the greatest possible regard is paid to the advice of men who have been "through the mill" themselves, and who from every-day experience know what is required to-day and what is likely to be necessary to-morrow. Hence I do strongly advise you, if you make a move in this matter, to avail yourselves of the assistance, ripe experience, and good judgment of the senior members of the industry. I am sure that if they are asked, they will freely help.

I have already mentioned some of the requirements of the modern gas engineer. But lest my suggestions should be misunderstood, or thought to be too ambitious, let me here explain, that what I have in mind is the drawing up of a scheme of progressive education to extend over three or four years, in which good ground work in the first principles of engineering, chemistry, and physics, together with the classes in "Gas Manufacture and Supply" should be obtained; and this course should be supplemented by others, carefully drawn up for the use of those who wish later on to specialize and do more advanced work. There are numerous higher courses of study already available for those who desire to extend their knowledge, and very little trouble will be experienced in obtaining from existing classes all that is required. What is really wanted is a careful selection, made by men of experience, of definite groups of suitable work. Examinations, would, of course, be necessary; but I do not think, for the present at any rate, any others would be required than those already in existence in connection with the Board of Education or the City and Guilds of London Institute. Very friendly relations exist between Sir Philip Magnus, M.P., the Superintendent of the Department of Technology of the City and Guilds of London Institute, and the Council of the Institution of Gas Engineers; and if he were approached, I do not think it would be difficult to arrange for the granting of technological certificates for the completion of certain courses of study and examinations. A certificate for groups of examinations is already granted by the City and Guilds of London Institute; but this is not sufficiently comprehensive, and differs considerably from what I think is necessary for the junior members, whose case we are now considering.

Examinations.

And here I would like to say a word about examinations. One sometimes meets engineers, for whom one has the greatest possible respect and admiration, who scoff at their value; and to some extent their criticism is probably justified in many cases. But when carried out in connection with a definite and well-thought-out scheme of study, there can be no doubt as to their value—in fact, they are indispensable. What makes examinations useless and almost farcical in their value is when one considers that students have obtained first-class honours in the gas manufacture examinations without ever having been on a gas-works; and I have been told by experienced lecturers in gas manufacture that they had had students who passed with first-class honours whom they would not have entrusted with the most elementary duties of management of works. But when examinations are taken after a well-arranged course of study, their value and importance are very much enhanced; and if the certificate so obtained can be backed up by one from a gas engineer, relating to the practical experience and training on a gas-works which the student has had, who shall deny that the possessor of such credentials is likely to be a good man, and one who is fairly well assured of success? Further than this, apart from the discipline and instruction which a set course of study and its satisfactory completion will provide, it will be more than merely *primâ facie* evidence of energy, perseverance, and capacity for doing things, which cannot but be of the greatest possible assistance, not only to the student himself, but as an indication of merit to those who may require his services. One of the chief advantages which will follow the preparation of a definite scheme of study, apart from its intrinsic value, is that it will provide something to work for, a goal at which to aim, the attainment of which will give a young man reasonable prospects of success. My own experience, and I expect that of many of you, is that unless one has something definite for which to work, it is very easy to be diverted by the many attractions which waylay one for the absorption of one's spare time, and the good intentions of the student frequently fail without his being guilty of incapacity or lack of energy. If a well-defined scheme which has upon it the hall-mark of approval from the leaders of the industry can be set before a youth at the beginning of his career, and at which he can set himself to work for a certain number of years, I feel no doubt of the advantages which will accrue to him from it compared with the uncertainty which now exists. It is perhaps unfortunate that this work will have to be undertaken at evening classes; but this is not a very serious handicap. There are very few of us here who have not spent many hundreds of hours in evening study; and although it may not be ideal, it is quite harmless if a student possesses normally good health, and does not work to excess.

The Task Ahead.

I have now briefly outlined to you a method which might be pursued in supplying what I consider—and I do so in common with many others—to be a serious deficiency in our industry. Time will not allow of my going into the matter in more detail now, but I commend its consideration to you with the greatest possible earnestness. My junior days are not far behind me, and it is a very great pleasure to me to still maintain a close connection with the doings of the junior members of the profession not only in this Association, but also with my friends in the Southern Junior Association, who have done me the honour to elect me one of their Honorary Members. I have, therefore, brought before you to-night a subject which, in my opinion, as the result of observation for many years past, is of the utmost importance to the junior members of the profession themselves, and no less important to our industry. It is a matter in which I believe you can initiate, and assist in bringing to completion, reforms which will be of the greatest possible benefit to both.

Here, then, is a task worthy of any time and trouble you may give to it, and one which I am sure you will never regret. There are large numbers among you whose careers (as I have said) are already shaped, and who, either by their own unguided efforts or with the advice of friends, have found a way to equip themselves so as to obtain a good footing on the ladder of promotion. To them a scheme of study and education such as I have indicated is not necessary, and has no personal interest. But to them I commend this task of doing something for the younger members of the Association, and for those who come after them. We are engaged, gentlemen, in assisting to carry on an industry of which we have every reason to be proud; and it is our duty to conduct ourselves, and so act now, that what we have received from our predecessors is carried on not only with energy and success, but that we give more than a passing thought to the future. The gas industry has now been in existence more than a hundred years, and, with the allied trades, has a capital of more than two hundred million pounds. It was never in a sounder condition than it is is to-day; and if we see to it that those who are to carry it on in the future take full advantages of the many facilities for education which are now available, and so are well-equipped for their work, there are still greater victories in store for it.

The Future of Gas.

Never pay the slightest heed to the croaker who amuses himself by stupid calculations as to how long gas will last, or be alarmed by the advances of our great competitor electricity. For every improvement hitherto made in electric lighting, gas has always gone one better; and in heating we have always been supreme, and must remain so. Forty years ago it was confidently asserted by our friends, the electricians, that there would be no such thing as gas lighting in ten years time. What do we see to-day? Unfortunately for themselves, many holders of gas stock in those days lost large sums of money by selling out at ruinous prices, and wise men bought their shares. Of one thing you may be sure, that, in some form or another, the carbonization of coal, and the utilization of the products obtained from it, will be carried on for a very long time yet; and it will lie with us, and those who come after us, to see that the best possible use is made of these products. That alone will be the measure of the life of the gas industry. The carbonization of coal is still very imperfectly understood; and just as the arrival of the vertical retort has brought many changes during the last ten years, so many others, more far-reaching, are

probable during the next twenty. The purification of gas, after standing almost stationary in its methods for many years, is now about to undergo more change and improvement.

In the distribution and sale of gas many changes are now also taking place. In the application of gas for heating alone, the changes and improvements during the last five years have been most extraordinary, and many others will take place very soon. Only ten years ago, anyone who forecasted the day when coal-fires would be a thing of the past would have been thought a visionary; but who would scoff at such a prophet to-day? It may be that great changes will take place before the day arrives when gas is universally adopted for heating purposes; but it is certain that if we make the most of our opportunities, and of the magnificent raw material we use, such a day will not be far distant in the future. What share we take in this future depends to a very great extent upon ourselves. No scheme of study will remove the necessity of careful application, earnest individual effort, and high personal character; but these things being equal, I am sure that the man who proceeds with his studies with a definite aim in view will be far more likely to succeed than one who has no such plan. I am equally certain that many to-day are not holding the positions in the gas industry which their capacity and ability should have entitled them to hold, because they had not the good fortune to have a guiding hand to direct their studies in their younger days.

I would, therefore, urge you to equip yourselves as well as you possibly can while you have the opportunity, and you need have no care for the future. Success must be yours.

MIDLAND JUNIOR GAS ASSOCIATION.

Annual Dinner and an Address.

A party of about sixty assembled at the Great Western Hotel, Birmingham, last Saturday evening, on the occasion of the annual dinner of the Midland Junior Gas Association; and a very pleasant time was spent. There was a nice musical programme, the items of which were well rendered; but the evening was not entirely given over to feasting and song. It had its serious hour, which was devoted to an address by Mr. F. J. Bywater (Engineer of the East Greenwich Works of the South Metropolitan Gas Company, and the first President of the Association), and a few speeches. The address, which dealt with a subject of the first importance to the members of the Association, will be found on p. 431, and some points from the speeches are given below.

The chair was occupied by the President (Mr. W. H. Johns, of Malvern); and the visitors and honorary members present included Mr. Harold E. Copp (West Bromwich), Mr. John Foster (Windsor Street), Dr. W. B. Davidson (Nechells), Mr. E. W. Smith (Nechells), Mr. James Hewett (Saltley), Mr. H. L. Whatley (Clerk to the Malvern Urban District Council), and Mr. John Wilson (Oldbury). Mr. R. S. Hilton (Secretary to the Birmingham Gas Department) was unfortunately unable to be present, in consequence of a previous engagement; and other letters of apology for absence which were received included one from the President's Chairman, who wrote that indisposition kept him away, and wishing the Association every success and a most pleasant evening.

Mr. Bywater's Address.

The President, in proposing a hearty vote of thanks to Mr. Bywater for coming down and giving them such an excellent address, remarked that he had enlightened every one of them with regard to the education of the gas engineer. Members of the Junior Associations had a very great function to perform, and important duties to undertake in connection with the development of the gas industry of the future; and if they were not thoroughly educated, and ready to take up these duties, the industry would suffer. Therefore Mr. Bywater's remarks should be seriously considered by every one of them, and every possible effort should be made to apply the suggestions which he had put forward. With regard to the qualifications of the future gas engineer, he agreed entirely with what Mr. Bywater had said, and thought they should all not only be ready to manufacture gas and to deal with the engineering and chemical problems with which they were faced every day, but should engage in the study of electrical engineering, so as to be prepared to meet the competition which must fall across their path. He was glad mention had been made of the fact that Mr. Allen, the President of the Institution of Gas Engineers, had entertained the matter which was hinted at when they had the pleasure of meeting him at the recent Gas Exhibition—that the Juniors should be recognized to a greater degree than had been the case in the past. Mr. Allen and the Committee of the Institution had done the Junior Associations a very great honour in inviting one of their members to read a paper at the Liverpool meeting in June: and he hoped the fortunate one would be a member of their own Association.

The Examination Question.

The question of examinations was a complex one. As a lecturer in gas engineering, he had found a great difference in the preparations which had been made by students before going to a class to study this subject. It was his opinion that no student should present himself before he was fully qualified in the advanced stage of chemistry and various engineering subjects. Further than this he should at the same time, if he intended to take charge of a large undertaking, qualify himself for the examination of the Institution of Civil Engineers. By becoming a member or an associate member of the Institution, there was no doubt that greater prospects were held out to a man than if he neglected to take up these subjects. With regard to electrical competition, he was glad that Mr. Bywater had brought this in. There was keen competition to be faced, and many methods—some of them, perhaps, not altogether above board—were adopted by their competitors to secure a footing. Such tactics had to be met and overcome; and the commercial side of the gas undertaking was the one to which they had to look to do this. Therefore, not only had a man to be an engineer, but he had also to be a commercial and business man to "keep his end up." Mr. Bywater had hinted that they were to expect greater developments in the gas industry as regarded lighting. He hoped they would shortly see some improvement in this direction. They all knew that at the present time, with high-pressure gas, their electrical friends had much to fight against—with all due respect to their half-watt lamp, which he did not think was going to trouble the gas industry much in the matter of inside lighting. The system of gas purification which had been so successfully developed by the South Metropolitan Company would undoubtedly be to the general benefit of the industry; and they should all be deeply grateful to the Company for the work they had undertaken, and for the difficulties they had overcome in connection with the sulphur nuisance.

Dr. W. B. Davidson, in seconding, said the juniors had a very great "friend at court" in Mr. Bywater, and anything they proposed to take up would be strongly supported by him in London. The address must prove extremely helpful to them all. There was no doubt that many a young fellow thought he had done everything when he had passed with honours in "Gas Engineering" and "Gas Supply." Of course, they were very big subjects; but gas manufacture was wonderfully wide, and he did not suppose there was anyone alive who really did justice to it. It was impossible to learn all the subjects in the way in which they should be mastered. He certainly admired the pluck and perseverance of many young fellows in studying in the way they did. It was an uphill task to do a good day's work on a gas-works or elsewhere, and then in the evening study in the manner that was necessary. One was, however, repaid for doing it. All needed to keep on studying; and they would be the happier for it.

Mr. Bywater, after the vote had been carried by applause, said he had brought before them in his address something which was very near his heart, and he had done it with the utmost sincerity. He had stated what he thought was of the greatest importance to them. He had that morning been talking with Mr. W. Doig Gibb, the Chief Engineer of the South Metropolitan Gas Company, who had had much to do with examinations; and he said that his experience of the students who took the examinations in "Gas Manufacture" was that their general engineering and chemical knowledge was very poor indeed. Something, he added, certainly ought to be done, not only to prevent students of this standard sitting at all, but to point out to the student what course of study he should follow. It ought not to be left to the individual effort of the student to get along. There were many well-known gas engineers and chemists who were only too anxious to place their knowledge at the disposal of students; and he thought it was a pity that those who were ready to work should not have the advantage of this assistance. If only the matter were properly taken up, something would be done; and in this event, he would feel amply repaid.

Mr. H. E. Copp proposed the toast of "Prosperity to the Midland Junior Gas Association." He congratulated the members on the progress they had made, and said he always liked to be present when Mr. Bywater gave an address, because he always had something important to say. What they had just heard was no exception. Mr. Bywater had put into words what many of them had had in their minds for a number of years. Of course, this was an age of—he was going to say superabundance of technical matter. There was an enormous amount to wade through. They did not like to leave it, because they might be missing something useful; but the process of separating the chaff from the wheat was sometimes troublesome. There was no chaff in what Mr. Bywater had said to them; and reading through the "Transactions" of the Association, he did not find any chaff there. He thought the standard maintained by the Association was of an exceedingly high order. Last year he said this; and he was glad to be able to repeat it now. For one thing, they were to be congratulated on securing the assistance and sympathy of so eminent a man as Professor Burstall, whose lectures on the internal combustion engine must have been of great value to everyone interested in that branch. Gas-engines were one of the most important things they must look to in the future for the development of the industry. One of the great things on which their prosperity would depend was the utilization of gas for power; and this, of course, would only come about by the reduction of illuminating power. He was in full sympathy with what Mr. Bywater had had to say about education. Education was absolutely essential; but there were more candidates than vacancies. This was a healthy sign for the well-being of the industry. They could not all secure important appointments; and granted the education had been obtained, there still remained a certain element of what he might call luck. But beyond this a thing which was of great importance was personality. They must have education first; but they must also possess personality to command success.

The Half-Watt Lamp.

Reference had been made by Mr. Bywater and the President to the subject of competition. Education and personality were more than ever necessary if they were to meet this competition, which would not diminish, but would increase. They had heard a good deal lately about the half-watt lamp; and as to this he could hardly agree with the President in the remarks he had made. So far as he could see at present, it was going to be a very serious competitor; but he was sure it would not do the gas industry any harm. It would simply spur those capable of increasing the developments of gas on to still further efforts; and the industry would rise to the occasion, as it had done previously. He had had the privilege of examining one of these half-watt lamps in London; and he was much struck with the beauty of the light and its intensity. It was not, he thought, quite so good a quality of light as a high-pressure gas-lamp, which was as near perfection as anything at present. But the lamp he saw had been at work 200 or 300 hours; and its efficiency had not gone beyond 0·75 watt. It was only a matter of time before it would be brought down to suit-

able sized units for domestic lighting. The principle was undoubtedly good. Of course, in Birmingham those who were privileged to be employed under the Corporation had unique opportunities of witnessing the development of the high-pressure lamp; and the developments that had taken place in the city in this direction were really wonderful—so much had been accomplished. The development of lighting did not consist merely in buying a lamp and fixing it. There was a lot to be found out about the lamps.

The PRESIDENT, in reply, remarked that Mr. Copp seemed to imagine he belittled the efforts of the electricians; but this was not the case. There was no doubt they had strenuous competition to fight; but the half-watt lamp in its present shape and form did not offer serious competition with regard to domestic lighting. The price of the lamp, to begin with, was in the neighbourhood of 30s.; and this for a 600-candle lamp—which was hardly suitable for domestic lighting. They must not, however, think it was going to stop there. He thanked Mr. Copp heartily for the kind words he had said with reference to the Association.

The SENIOR VICE-PRESIDENT (Mr. F. J. Ward) proposed the next toast—which was "The Visitors and Honorary Members." He pointed out that the Association were very fortunate in their list of honorary members, by whom they were actively supported.

THE DANGER OF OVER-EDUCATION.

Mr. E. W. SMITH, who replied, said the excellent address they had had from Mr. Bywater would give an enormous impetus to the work that was being attempted by those who were anxious to assist the education of the juniors. To his mind, probably one of the biggest dangers that would have to be recognized was in the over-education of junior members of the industry. Even some of the present syllabuses of the City and Guilds of London Institute were, he thought, too broad; and it would have to be realized that there were three distinct sections to any gas department or gas company. There was the gas management, there was the gas engineering, and there was the gas making. It was possible for one to have a knowledge of all three; but the tendency of the future would be to specialize in one of them. The engineer would be the constructional engineer, and would depend upon a technical staff of chemists and others for the manipulation of gas manufacture, subject entirely to him. It was impossible in one lifetime to learn how to be a satisfactory gas maker and also to be a good engineer. The future being, as it would be, in the direction of the turning out of a better product—a purer gas on more scientific lines—this would necessitate greater attention to the scientific study of gas making. He did not think the industry had anything to fear from the half-watt lamp. There would have to be an alteration in the application of both gas and electricity to lighting. He believed the semi-indirect system would be the light of the future for both domestic and shop purposes. All forms of direct lighting were unhealthy, and not normal. Consequently, semi-indirect lighting would be the development which would come. Mr. Copp had complimented Birmingham on its high-pressure lighting; and he would like to say the huge success scored in this direction had been entirely due to Mr. Barrett and his assistants. Any high-pressure work which he (Mr. Smith) had been associated with had been entirely in industrial heating.

Coke-Oven Managers and Gas Associations.

In view of the proposal which has been made for the formation of a Coke-Oven Managers' Association, the Council of the Scottish Junior Gas Association (Western District) instructed the Hon. Secretary—Mr. David Fulton, of Helensburgh—to inform the various coke-oven managers that membership of the Association is open to those who are engaged in the coking industry. He has therefore sent them a circular containing a few particulars regarding the Association. The Council feel that there is in many things a great similarity in the interests of the gas and coke making professions, and that interchange of ideas is sure to prove mutually profitable. They say they would be glad to include in the syllabus from time to time papers dealing with coke-works practice, and to do all in their power to make the work of the Association of interest and benefit to those engaged in these works.

Yorkshire Junior Gas Association.—We learn from the Hon. Secretary (Mr. Edward Garsed, of Kippax) that the next meeting of the Association will be held at the Mechanics' Institute, Bradford, next Saturday, when the President, Mr. Charles Roper, will deliver his Inaugural Address, in which he will deal with the subject of distribution. At the close, questions will be invited. The circular issued by the Secretary informs the members of the invitation issued by the President of the Institution of Gas Engineers (Mr. Edward Allen, of Liverpool) to the Junior Gas Associations for a member to read a paper at the forthcoming annual meeting, to which reference was made in the "JOURNAL" last week (p. 341).

Ely Gas Company and Electricity Supply.—In recently noticing the Provisional Orders for which gas companies are making application, there was omission in not referring to the Order lodged by the City of Ely Gas Company, Limited, for giving them authority to supply electricity within a specified area of the city. The Company propose to place themselves under an obligation to lay suitable and sufficient distributing mains within two years after the commencement of the Order. The maximum prices proposed to be charged per quarter are 11s. 8d. up to 20 units, and 7d. per unit beyond. It is intended that the generating station shall be at the gas-works; and, after the powers are conferred, the Company will be known as the Ely Gas and Electricity Company, Limited. Messrs. Monier-Williams, Robinson, and Milroy are the Parliamentary Agents for the Company.

NOTES ON FOUNDATIONS.

By KENNETH MACKAY, of Falkirk.

[Extracts from a Paper read, Feb. 7, before the Scottish Junior Gas Association, Eastern District.]

Bores that were put down at the Falkirk Gas-Works in April, 1913, showed that the nature of the soil gave every reason for suspicion; and that there has been subsidence at various parts of the works, there is no doubt. At the extreme north end of the works is the coal-store; and the gable-end had shown weakness shortly after it was built. This, perhaps, was somewhat due to the building of the coal-breaker pit, which is 25 feet long by 15 feet broad by 15 feet deep.

As time wore on, it became apparent that something would require to be done, as the side walls to the west began to fall away from the gable. At first there were procured, and fixed through the side walls, long 2-inch binding bolts, with right and left handed screws in the centre; these having on the outside large wall plates and nuts. Then the tension was put on. But this was not a satisfactory job, as the building showed that the crack was still opening-up—varying from 1 to 2 inches in width. We then decided to build a buttress against the side wall. In the same parallel line as the gable stood a little weighbridge, 17 ft. 6 in. from the side wall; and from there we laid in a bed of concrete, 3 feet by 3 feet deep, on which we built a brick wall 27 inches thick, 15 feet high at the weighbridge end, to 23 feet high at the side wall of the coal-store—tying both ends into the existing building. After this was done, we proceeded to cut out a few courses of the brickwork at the crack. This was rebuilt and properly tied in; and thus the work was proceeded with till the whole of the crack was rebuilt—a distance of some 30 feet.

Our attention was next directed to the sinking at the retort-bench, the foundation of which was 140 feet by 23 ft. 6 in. broad by 3 feet thick; this being made of whinstone, sand, and cement. But I should like here to impress upon you that, when laying in foundations, you should have them made of brick or old retorts, as it is a well-known fact that there is no material that has the same suction as brick. These works were built in 1904; and at various intervals suspicions were aroused that the ground was in a very unsettled state. During the summer of 1906, the hydraulic main had to be re-levelled, and cast-iron distance-pieces put in between the ascension and bridge-pipes to make up the difference in height. The alteration at this time was the means of causing all the hydraulic mains to be on different levels; and this displaced the tar-tower, which regulated all the seals, thus causing each hydraulic main to have a separate seal-valve. By this means, we were able to go on for some time longer.

I now come to the last alteration—that is, the underpinning of the retort-bench. As an address on this subject was given by Mr. John Wilson, of Falkirk, to the Western District,* I have no doubt some of you will be quite familiar with the rudiments of the process; but as it is always better to have a subject explained by one who has had the opportunity of seeing the work carried through, I thought it might be to your advantage to have it explained here. [This Mr. Mackay proceeded to do in the terms that have already appeared in the "JOURNAL."]

DISCUSSION.

Mr. H. O'CONNOR referred to his interest in the matter of foundations, instancing the work he had done at the Beckton Gas-Works, where all foundations had to be carried down 30 feet below the surface, and required constant pumping to keep them clear of water. He also referred to the testing of the soundness of the foundations for the columns of the pier at that works, which were loaded with 500 tons of metal, and had to bear this weight for three days without any sinking. The method adopted at Falkirk was, he thought, very ingenious, first in the making of the piers as far apart as possible, and gradually getting nearer to each other, until only the alternate spaces had to be removed. The trouble at Falkirk showed how necessary it was that the exact nature of the subsoil should be understood, so that adequate foundations could be provided in the first instance. In the present case, this could have been accomplished by a series of piers or walls, arched over, which could have been done at much less expense than after the original foundation was completed. As to the coal-store wall, he had been consulted by Mr. M'Crae regarding this, and had advised its construction on different lines from those carried out. He would be interested to know whether the cracks in the walls were caused by the thrust of the coal on the wall or by a subsidence of the foundation.

Mr. A. WADDELL said that he, too, had had some experience of bad foundations, and, in fact, had found running sand where he had to erect a tank. He had overcome this trouble, but would not care again to go through the difficulties that he had encountered. Such papers as the one he had just heard might be regarded as of great value to an Association like theirs. One never knew how soon an experience of this kind might be encountered; and it was well to have the details of such work recorded, so that reference could be made to it when required.

* See "JOURNAL," Vol. CXXIV., p. 55.

THE LIGHTING OF LONDON.

Progress, and Some Suggestions for Future Consideration.

At an Ordinary Meeting of the London Society last Tuesday, at the Royal United Service Institution, Whitehall, Mr. LEON GASTER read a paper (illustrated by lantern slides) on the above subject. Colonel R. E. CROMPTON, C.B., was in the chair; and he opened the proceedings with some complimentary remarks as to the part Mr. Gaster has taken in advancing the study of the art of illumination, and raising its status.

In the opening of the paper (which was an extensive one) the author referred to the vastness and intricacy of the subject. He considers that in the history of the development of the various local authorities in the Metropolitan area may be found the clue to many of the anomalies in its lighting. From visits abroad, however, he admits that though there are some respects in which we can learn a good deal from our neighbours, London as a whole, and in particular the city area, need not now fear comparison—in fact, the recent improvements in the lighting of main thoroughfares have excited considerable interest abroad. Any criticisms made in the paper are therefore only with the view of suggesting means for securing better results in the future.

The author ventured back in his historical review to mediæval times. Coming to the days of the use of the oil-lamp in street lighting, allusion was made to a booklet issued by Count Thivelle in 1800. Therein reference was made to the inefficient character of the oil-lamps in bull's eye lanterns, placed on Westminster Bridge, and description was given of quite a number of ingenious devices "employing reflection and refraction" for directing the rays of light on the surface of the street. Commenting on the unusual nature of the street lamps of those days, the Count remarked that "the result is that light is thrown upon the eyes of the passengers without illuminating the streets, since no part of the pavement receives any benefit from the effect of the light. . . . The utmost degree of perfection would be attained if the whole pavement and streets could be illuminated without our perceiving from whence the light proceeds." The great chemist Lavoisier, who was responsible for the design of many of the improved street lamps using reflectors in Paris, was struck by the same defect in the lighting of those days. The acute comment of these two savants, that the function of a street lamp is to illuminate the pavement, and not to shine in the eyes of passengers, might be taken to heart by many responsible for street lighting to-day.

THE COMING OF GAS LIGHTING.

This was the state of things when gas lighting came to be introduced about the beginning of last century. From the records of those times, some evidence is found as to the order of illumination provided. For example, in Pall Mall (which was first lighted by gas about 1807) the gas-burners introduced were stated to give an illuminating power equal to about 3-candle power, and even this was considered a tremendous improvement upon what had been provided before. For example, in a report issued at that period, it was stated that the new lamps were equivalent to eighteen of the old parish oil-lamps. According to this rating, the old oil-lamps can only have furnished about $\frac{1}{6}$-candle power. At the present day, Pall Mall is lighted by high-pressure gas-lamps estimated to give several thousand candle power.

Through the courtesy of the South Metropolitan Gas Company the author obtained some particulars of the history of lighting in their area. It appears that in the period 1860-1878, iron tip flat-flame burners consuming about 5 to 6 cubic feet of gas per hour, and yielding approximately 12-candle power, were in general use; and this procedure was probably characteristic of the whole of London. In 1878, steatite burners giving about 15-candle power were substituted; and at a later period (1895) two burners, or special Sugg burners, consuming 10 cubic feet per hour, and yielding perhaps from 30 to 40 candle power, were sometimes used on refuges and in important positions. It was not until the commencement of the Twentieth Century that incandescent burners began to be used; the first borough to instal these being Camberwell in 1899. These were No. 4 gas-burners, consuming about 4½ cubic feet per hour, and giving 50-candle power; for the side streets, burners giving about 20-candle power were used. In 1900 incandescent burners were introduced into Lambeth, and other districts soon after. At the present day inverted burners are very generally used throughout London; and many streets lighted by low-pressure contain two burners, each consuming about 4 cubic feet, and yielding together about 240-candle power.

Mr. Talbot, the superintendent of outdoor lighting to the South Metropolitan Gas Company, informs the author that the comparative conditions of public lighting in the district in 1882 and at the end of 1913 were approximately as follows:

Public Lighting in the South Metropolitan Gas Company's District, 1882 to 1913.

Date.	No. o. Burners.	Total Candle Power (estimated).
1882	14,014 (flat-flame) ..	175,175
1913	24,560 (incandescent) ..	1,410,250

A calculation shows that in spite of the candle-power being increased about eight times, the cost is presumably *less* to-day than it was in 1882.

The condition of public lighting by gas from the oil-lamps period up to the present day is somewhat as follows:

Nature of Illuminant.	Period.	Public Lamps—Gas Consumed. Cubic Feet per Hour.	Candle Power.	Candle Power per Cub. Ft.
Oil-lamps	Up to 1800 ..	—	.. ⅓-1 (?)	.. —
Early gas-burners . .	About 1810 ..	3 (?)	.. 3	.. 1 (?)
Iron-tip ,, . .	1860–1878 ..	5–6	.. 12	.. 2½
Steatite ,, . .	1878 ..	5–6	.. 15	.. 3
Special Bray and Sugg burners	1895 ..	10	.. 30–40	.. 5
Incandescent upright (early type), low-pressure	1899 ..	4½	.. 50	.. 11
Incandescent inverted, low-pressure.	1908–1914 ..	2½–8	.. 35–240	.. 30
Incandescent inverted, high-pressure . . .	1914 ..	40–70	.. 2000-4000	..50–60

An important point to notice in this table is that the rate of progress has become increasingly rapid during the last few years. Previous to 1880 few radical improvements were made in street lighting, which remained substantially the same for many years. But since 1900 the progress in illuminants has been very great. The introduction of high-pressure gas has added immensely to the brilliancy of the lighting in many of our main streets. The author is informed by Mr. F. W. Goodenough that, during the last ten years, the total candle power of the lamps in the area of the Gaslight and Coke Company has increased from 1,900,000 to 4,300,000—an increase of over 125 per cent.

ELECTRIC LIGHTING.

Then came information as to the progress of electric lighting—reference being made, for example, to the progress of lighting on the Embankment, which is now mainly illuminated by flame arc lamps, the total candle power of which is estimated to be nearly 200,000—*i.e.*, about 75 times the value of the lamps used about 32 years ago (1882). Then allusion was made to the reports presented by (the late) Sir William Preece to the Electric Lighting Committee of the Commissioners of Sewers in 1883; in this connection the author stating that in many respects Sir William was remarkably ahead of his time; for in his report he not only gives the candle power of the lamps, but calculated the actual illumination on the street surface. In Cheapside, at the date of the report, Brush arc-lamps were used, giving about 400-candle power, and placed 150 feet apart. In 1910, 1897 feet of roadway in Cheapside were illuminated by 2800-candle power Oliver flame arc lamps. Besides being more powerful, these lamps are better placed, and nearer together than in the old days. A rough calculation shows that the total light provided is now quite eight times what it was in 1882; yet, as near as can be estimated, the cost is probably about the same.

INFLUENCES OF COMPETITION.

Within recent years substantial increases have been made in the light provided in many London streets. Thus in High Holborn the present lamps give approximately ten times the light that prevailed in 1900; and in Fleet Street, the total candle power provided was roughly 3600 in 1905, 24,000 in 1908 (high-pressure gas-bracket lights), and 28,000 in 1913 (high-pressure gas lights, centrally suspended).

In most cases, owing to the great improvement in the efficiency of artificial illuminants, these large increases in candle power have been made without great expenditure. The progress in gas lighting was accompanied, step by step, by corresponding improvements in electric lighting—each new development calling out some new effort on the part of the rival illuminant. Thus the commercialization of electric lighting about 1880 was probably indirectly responsible for the coming of the incandescent mantle. Similarly the development of the inverted mantle about 1905, and of high-pressure gas lighting a little later, were met by the invention of the metallic filament lamps and the flame arc lamp. Whereas with the old carbon filaments one could not, in the best circumstances, obtain more than about 0·3-candle power per watt, with the ordinary metallic filament lamp one can get about 0·75 or even (in the higher candle powers) 1-candle power per watt. Similarly the old enclosed arc lamps yielded only 0·5-candle power, the best ordinary open arc lamps of later years 1-candle power per watt; but the flame arc lamps developed during the last five years as much as 5-candle power per watt. At the present time engineers are all interested in the coming of a new form of metallic filament lamp, which is stated to yield as much as 2-candle power per watt; and it is probable that lamps of this kind yielding 3000 or even 5000-candle power may soon be in common use. While the flame arcs, like the high-pressure gas-lamps, have been used chiefly for the lighting of main streets, the metallic filament lamps have been widely used for side street lighting. But Holborn provides an instance of the use of, quite recently, clusters of metal filament lamps for main street lighting.

In view of this constant improvement in illuminants, it is obvious that the nature of the contract entered into by a municipality for street lighting is an important matter. Not infrequently the existing contract ties the public to a certain expenditure of energy irrespective of the improvements in illuminants that may occur meanwhile; and it is only when the contract expires that advantage of such improvements could be taken. On the other hand, in some cases (as in the City of London) a special clause

has been inserted providing for the possibility of changes being made to the mutual advantage of the company and the public. The City of London is an instance of what may be done by taking prompt advantage of modern illuminants. It is estimated that, as a result of improvements, the total candle power in the City area (both gas and electric) is being increased by no less than 600,000. Nevertheless, there will be an annual saving in expenditure of over £6000.

Improved Methods of Street Lighting.

It will be observed that the conditions determining the lighting of streets in all great cities have entirely changed during recent years. At the present time one of the most important factors is the increased speeding-up of traffic and the all-prevailing motor vehicle. In order to enable drivers to steer their way in London traffic, they must be able to see a long way ahead; and a brilliant illumination is desirable. On the other hand, people are beginning to ask whether this enormous increase in light is not sometimes misapplied. Most thoughtful observers agree that many of the present lights err on the side of "glare." They illuminate the pavement brightly, but they also throw their rays into the eyes of passers-by, producing an inconveniently dazzling effect. The author believes that, before long, enlightened public opinion will insist on better methods of screening public lamps, and on their use high up at a reasonable distance from the eye. Sometimes the glaring effect is intensified by the fact that new and more powerful illuminants are planted on lamp-posts intended in the past for lamps of far lower brilliancy. As an instance, the author mentioned the massive three-light post on the island in Trafalgar Square. In the past the light in each of the globes came from a cluster of Sugg flat-flame gas-burners, giving perhaps 120-candle power. To-day, 2000-candle power high-pressure gas-burners have been substituted in each lantern; and this powerful light is concentrated within a much smaller area than was the case with the old flat-flame burners. The present burners would answer their purpose much better if the direct rays were screened from the eyes of pedestrians and drivers. Similar considerations apply to the use of powerful high-pressure gas lights and flame arc lamps outside shops. In the City area there is a regulation requiring these lamps to be screened on the side facing the street; and, to the author's mind, it would be no hardship if this regulation were extended to the rest of London.

There has been some difference of opinion as to how distribution should be accomplished; but it seems now to be pretty generally agreed that, while some light should be allowed to illuminate the houses of a street and the surroundings, so that they are not in complete shadow, most of the light should be directed downwards on the pavement and roadway. There is room for enterprise in the design of reflectors more perfectly designed to accomplish this. Similarly most people would agree that the illumination along a street should be fairly uniform and not "patchy"—*i.e.*, that the parts of the pavement most remote from the lamps should not be left in complete darkness while the portions near them are extravagantly lighted. To accomplish this, special prismatic globes have been designed for use with flame arc lamps which deflect the rays of light in such a way as to increase the intensity on these more remote portions of the road. At present the difficulty is to accomplish this spreading of the light without increasing the effect of glare to persons approaching the lamps from a distance.

The question of providing uniform illumination is closely associated with the problem whether to use very powerful lamps high up, or lamps of moderate candle power at more frequent intervals. The latter method, though more usual in side streets than main streets, is thought by some to make it easier to provide uniform illumination. The method of arranging the lamps in the street differs according to the locality. Oxford Street is lighted by two sets of flame arc lamps mounted on tall central posts; Fleet Street was for a short time lighted by high-pressure gas-lamps attached to the houses by brackets; but most streets are lighted by lamps on posts "staggered" on either side of the roadway.

The growing interest in street-lighting problems led the City of London Corporation in 1909 to appoint a deputation to visit a number of Continental cities. They came back impressed with the advantages of the method of "central suspension," and recommended it for the City.

As is well known, Berlin (which was one of the cities visited) was one of the pioneering cities in the use of high-pressure gas; and it is only recently that its extension here has been on a scale comparable with that city. In the United States the use of high-pressure gas has certainly been backward; but the author understands that there will be great progress in this direction shortly. Visitors from the States have expressed the keenest interest in the installations here.

There is, however, one point by which American and Continental visitors never fail to be struck—the great diversity of lighting in London. To them the idea of so many separate authorities in such close proximity, all following their own devices, comes as a revelation. Abroad it is the almost invariable rule for cities to be lighted on a consistent general plan. However, owing to recent improvements in the lighting of our main streets, we need not fear comparison with other cities, although a few years ago this would not have been the case.

The Street Lighting Specification.

The author then proceeded to refer to the work (as yet uncompleted) of the Street Lighting Specification Committee; and there was indication of the author's view that such a specification would have to be drawn up on very broad lines. Then it was heard that Continental visitors not infrequently speak slightingly of the lighting of Trafalgar Square, which they consider unworthy of the historic importance of the site. Their chief criticism is that the lamp-posts are placed in a somewhat casual fashion, and the heterogeneous combination of gas and electric lamps arising through the juxtaposition of adjacent areas of supply is unpleasing. Dr. Louis Bell, whose judgment on such a point deserves careful consideration, considers that the square is underlighted, and the lights placed too low. The lighting adjacent to the Houses of Commons was recently criticized on the ground that it made a dismal impression in comparison with the brilliant high-pressure lighting in Whitehall close by. It is surely out of place for the illumination in such an important spot, led up to by a thoroughfare like Whitehall, to be so much less than in the thoroughfare itself. On the other hand, some caution should be used in increasing the power of lamps placed at such a comparatively low level. In the author's view, the spectacular effect of the lanterns would be much improved if the candle power of the lamps they contain was increased by some form of white diffusing glass being substituted for the clear glass employed at present. A similar criticism might be levelled at the lighting of the outside of Buckingham Palace. The author went on to plead for better lighting of the London parks.

Miscellaneous Points.

There was next argument in favour of more decorative designs of lamp standards and lanterns—standards and lanterns more in keeping with the improved architectural surroundings, and more suitable for the purposes the lighting is intended to serve. When one considers that standards, besides achieving their purpose of supporting the lamps by night are prominent objects in the streets by day, the importance of artistic design is obvious. Should we ever possess a Ministry of Fine Arts, such as Sir Aston Webb has advocated, the author trusts that it will include in its functions some supervision over the artistic aspects of illumination.

The Control of the Lighting of London.

After an allusion to the lighting of bridges, tunnels, and subways, the author, in order to explain some of the anomalies in the public lighting of London, referred to its historical development. From his inquiry, he found that, within the area of the County of London (approximately 117 square miles), there are at least thirty authorities concerned in the control of lighting. In this respect London presents a complete contrast to most cities abroad. But the position is complicated by another condition—the number of distinct gas and electrical supply companies by which it is served. Naturally there has been for some years a desire for concentration. Besides the disadvantages of the lack of standardization, it is suggested that such a large number of small companies cannot produce electric light as efficiently as a centrally-controlled large company could do; and we see in the success of the leading gas companies the advantages conferred by consolidation. At the present moment there is a Bill before Parliament for the consolidation of London's electrical supply. Whatever be its fate, we may be sure that union in some form is bound to come.

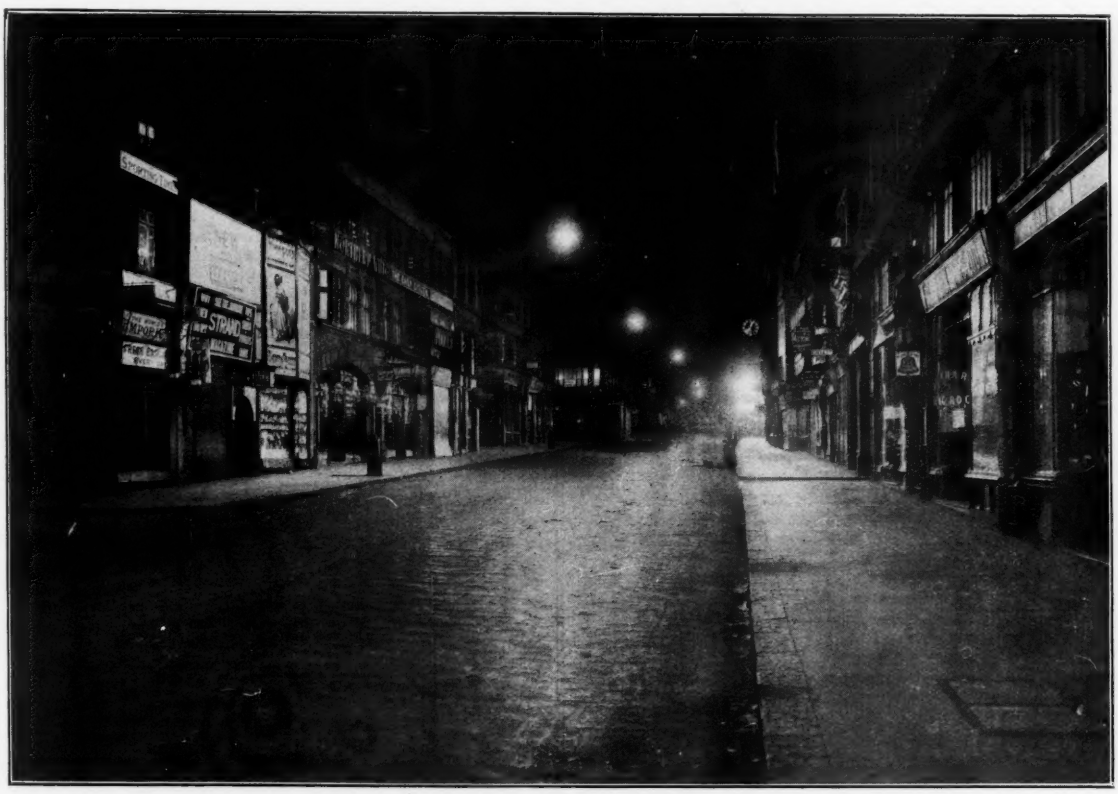
The local control of lighting by so many different authorities is also a source of inefficiency. The nature of the contracts entered into are widely different. In some cases the borough enters into a contract which offers no inducement to the contractor to instal improved illuminants; in others (the City of London is an enlightened example), provision is made for the contracting parties to share any resulting benefit. In the South of London, the contracts with the Gas Company practically always involve the purchase of the lamp-posts and their maintenance by the Company. But one borough, Bermondsey, prefers to attend to its own maintenance. In the City of London, on the other hand, the recent contract specifies that the standards, suspension gear, &c., provided by the Gaslight and Coke Company become the property of the City after ten years; while corresponding electric appliances may be purchased at the end of ten years for £2000.

The author thinks that a good case can be made out for the view that the lighting of London should be considered as a whole by one central authority. To his mind the lighting of streets is a most complex technical problem, and in the interests of traffic a most important one. The method of lighting adopted should therefore be determined by expert knowledge of the requirements of the particular class of street to be illuminated, and not by purely local financial or other considerations. It would be far better if, instead of illumination being left to local authorities who can only devote a small proportion of their time to lighting matters, it were made the care of some adequately equipped central authority *ad hoc*, who would keep themselves fully conversant with the progress of other cities, who could take a broad and impartial view of each problem as it arose, and who would be prepared to carry out experiments and collect full statistical data and information on the subject. The author understands that a few years ago the late Sir George Livesey endeavoured in vain to bring about a common system of lighting and contract in all the South London boroughs under the supervision of the South Metropolitan Gas Company. Even should it be found impracticable for the lighting of London to be actually paid for and maintained from a single source, it might still be possible to create a central authority on street lighting which could generally supervise and issue recommendations on the subject, and grant aid to

those boroughs which have important thoroughfares in their district, but cannot afford to illuminate them in a first-class manner. In the author's opinion, one function of such a central authority would be to allocate certain sections of London to the respective illuminants, and to do away with a great deal of needless bitterness arising from the present arrangements.

DISCUSSION.

Mr. A. P. TROTTER remarked upon the work Mr. Gaster had done in connection with the science of illumination, and in bringing together gas and electrical men, surveyors, oculists, and others to discuss the science and the engineering problems of illumination. Mr. Gaster had been the whole soul of the Illuminating Engineering Society. His (Mr. Trotter's) reminiscences carried him back to the early days when he first met Colonel Crompton at the Paris Exhibition in 1881, from which year was dated some of the progress in public lighting to which Mr. Gaster had referred, and which partly issued from the rivalry between gas and electricity. To Sir William Preece was largely due the very important principle that, in the lighting of streets and other public places, what was wanted was illumination. He stated most clearly in one of his reports to the Commissioners of Sewers in 1883



THE LUDGATE CIRCUS END OF FLEET STREET—LOOKING WEST.

THE EAST END OF CANNON STREET—LOOKING TOWARDS ST. PAUL'S CATHEDRAL.

[Photographs by Messrs. John H. Avery and Co., Hillmarton Road, N.]

that it was the illumination of the streets that was required, and that was to be paid for. It did not matter to the man who had to pay how the illumination was produced—whether many small lamps were used close together, or a few large unit lamps on high posts. What the man wanted was illumination; and it was for the engineer to find the most economical and efficient way of producing it. Sir William (then Mr.) Preece laid down this principle; and he was the first to invent an instrument for measuring illumination. Sir William felt, being a scientific man, that it was no use theorizing about illumination; but that one must subject illumination to the science of measurement. The work of the Committee on the Street Lighting Specification was still in progress. In connection with the inquiry by the Committee, he should like to say that minimum illumination by photometers was no good at all unless the results were those which the common-sense man would appreciate by the eye. They had an interesting experience in connection with the work of the Committee. Skilled and experienced borough surveyors made a tour of the streets of London at night, with Mr. Goodenough, and judged the illumination, dividing it into various classes: "A," "B," and "C." Then Mr. Edgcumbe, Professor Morris, and himself went round one night with photometers, and measured the illumination received 1 metre from the ground; and they listed the streets in the order of their illumination merit. On comparing this with the classification by the eye on the part of the borough surveyors, it was found that they exactly agreed. This showed that the practical measurement of illumination was a good common-sense method of arriving at what was being attained in the streets.

Mr. Frank Bailey (City of London Electric Supply Company) thought that the paper had shown graphically how the Metropolis ranked in all classes of illumination, and how all the units of light now used were much better adapted for the purpose than formerly. In all the more recent examples of illumination, the main object appeared to be to keep the lamps up as high as possible. The City Fathers, after their prolonged tour round the Continent to see what was being done there in street lighting, set them a task in the City which at the time appeared to be beyond their means of accomplishing—that was to carry out central suspension, and yet have the means of obtaining access to the lamps, without interfering with the traffic. It became necessary to carry out some form of suspension by which a man could make the lamp travel to the side of the road for cleaning and maintenance purposes. The difficulties, however, were soon overcome. Regarding the flame arc lighting in Cheapside, at first the criticism was made that it was too spectacular. What was spectacular five years ago had now become an absolute necessity; and, indeed, he thought the lighting in the City of London would become a standard for other parts of the Metropolis. It was impossible for them to go on without being dissatisfied with the illumination of some of the thoroughfares in London. Good lighting was now imperative. The coming of the motor-car had largely obviated road widening in London; and the use of the motor-car in turn had rendered necessary the use of higher candle power lamps for night illumination. But these lamps, with their very high intrinsic brilliancy, unless treated scientifically, would become a danger. He noticed with regret that the beautiful statues in London streets and places were not illuminated at night time. If they were worth looking at in the daytime, they were worth looking at at night time. There were the stained glass windows, too, in cathedrals and churches; he thought they ought to be illuminated so that people both inside and outside could see them.

Mr. C. A. Baker, Electrical Engineer to the London County Council, stated that he was not in agreement with Mr. Gaster and his colleagues upon the question of the street-lighting specification, because streets varied so much in all sorts of ways that it was difficult to fix any kind of standard illumination which was going to be suitable for all classes of streets in all classes of towns. As Mr. Gaster had told them, they could go through different parts of London, and find different lighting in the streets. In his opinion, what was in London to-day in the way of street illumination was not very far wrong. It was improved from time to time. But there was always the matter of pounds, shillings, and pence to consider. The lighting of some of the streets with which he (Mr. Baker) was concerned worked out to 15s. 2d. per yard run. For this 15s. 2d., he obtained an illumination which was good enough for all practical purposes; but he would like to spend 20s. or 30s. per yard run. The local authority, however, who were responsible for the annual bills, had so many other items in addition to the lighting upon which to spend money that it was necessary for him to see how much light could be obtained for so much money. As the lighting effect was increased from the number of cubic feet of gas or the number of watts consumed, the public got the benefit of this, so far as they wanted it; but he was not sure that the motorists liked too brilliant illumination at night time. With regard to the arrangement of lamp-posts, although different systems of illumination had been introduced from time to time, and might be in the future, still prominent street corners and crossings must always have good illumination; and from these fixed positions, one had to supply stepping-stones, as it were, from corner to corner. Intermediate illumination was therefore largely governed by the fixed points in the streets.

Another speaker criticized the use of lamps of high intrinsic brilliancy in the streets, remarking upon their harmful effect upon the eye. He also regretted the spoiling of handsome roads and the mutilation of the view in certain London streets by the use of central lamp standards—quoting, as an example, the view from the Conservative Club in Pall Mall looking towards the National Gallery.

The Chairman thought the lecturer in his general desire for a central authority had rather mixed up two subjects, which ought to be kept quite apart. Dealing with the lighting of the streets, he (the Chairman) thought this could be normalized or standardized with great advantage. He was in decided agreement with the last speaker as to the low placing of intense sources of light, such as they often saw outside tobacconists' shops, which were a real danger, and weakened the eyes. It ought to be a regulation that no source of light of such high intensity should ever be hung so low that it interfered with the vision. This was a thing that suggested itself to anybody who had had experience of the streets of London. He spoke strongly, however, against London being lit from one central source of supply. London was in itself a country, covering an enormous space, and nobody had ever got 9 millions of people massed together as had been done in London; and, in these times when labour was such a difficult and delicate problem, London should never be committed to lighting from one source. The way they had muddled through in regard to lighting in London had been a good thing; and it had this advantage, that in case of failures of supply, only local and not extensive districts had been left without [electric] light. Probably, however, eight or ten centres from which the means of illumination were supplied would be sufficient; thirty to forty were no doubt too many. He did not think it was altogether fair to the borough councils to say they had done their lighting work badly. They had improved the lighting from time to time; and considering the lighting of London as a whole—public and private—there was, in his opinion, no city in the world that came near to it. If there was one point upon which London was not prehistoric, it was its lighting. He was proud of his London in this regard.

Mr. Gaster, in reply, thanked the speakers for their very kind remarks concerning the work he had taken in hand in connection with illumination and the Illuminating Engineering Society. With reference to the Chairman's remarks, he had not suggested a central station from which the means of lighting for the whole of London should be supplied; all he meant was centralization as far as the work of control was concerned, in order to guide as to what should be done. To centralize the supply would be disastrous from a strategical point of view. As to the work of the borough councils, he did not say they did not do their best. But he did say that borough councils were composed of elements that did not know anything about lighting; and when they had committees to deal with the subject, it was a little troublesome for them to treat it at all adequately. He was certain the lighting of London could have been done better if it had been handled scientifically from the time that the subject of illumination was properly taken up. He hoped the Chairman would agree with him that illuminating experts who had no axes to grind with regard to one illuminant or another would be a great help to the borough councils. From succeeding remarks, it appeared that Mr. Gaster did not think that illumination could be adequately measured by the eye alone. He also agreed that there should be legislation compelling the shielding of low-hung high-power lamps on the street sides. Good lighting was an asset to any city; and while he believed London stood ahead in this matter, in his opinion something better still could be accomplished.

There was a hearty vote of thanks to Mr. Gaster.

THE HEATING OF RETORT-SETTINGS.

By David T. Marwick, of the Temple Gas-Works, Glasgow.

[A Paper read, Feb. 7, before the Scottish Junior Gas Association, Western District.]

The figures I shall bring before you and various points are in connection with vertical retorts; horizontal retorts having been well discussed at previous meetings of the Association.

Producer Gas.

The first requirement is a producer gas of the highest heating value practically obtainable. Pure producer gas contains 34·7 per cent. of CO (carbon monoxide) and 65·3 per cent. of N_2 (nitrogen); but it is not a practical possibility.

$$2\,C + O_2 + \text{nitrogen} = 2\,CO + \text{nitrogen},$$

or 24 lbs. $C + \frac{357{\cdot}5 \text{ cubic feet } O_2 + 1345 \text{ cubic feet } N_2}{1702{\cdot}5 \text{ cubic feet of air}}$

$$= 715 \text{ cubic feet } CO + 1345 \text{ cubic feet } N_2$$
$$= 2060 \text{ cubic feet producer gas.}$$

Steam is always used, and produces water gas—

$$C + H_2O = CO + H_2,$$

or 12 lbs. $C + 18$ lbs. $H_2O = 357{\cdot}5$ cubic feet $CO + 357{\cdot}5$ cubic feet H_2
$= 715$ cubic feet water gas.

Using coke which has come through vertical retorts, all the volatile hydrocarbons have been driven off; and the gas obtained contains CO_2 (carbon dioxide), CO, H_2, and N_2. The burning of 1 lb. of carbon to CO gives 4400 B.Th.U.; but burning it to CO_2 gives 14,647 B.Th.U. Thus air and carbon reacting give 30 per cent. heat inside the producer and 70 per cent. heat for use in the setting. But the temperature of the gases produced being very high on entering the setting, instead of 70 per cent. efficiency (the figure for cooled gas) we get as high as 85 to 90 per cent.

Air used alone would increase the temperature in the producer too high; hence the use of steam. In the second reaction, 1 lb. of carbon and steam needs 4320 B.Th.U. supplied. Thus the temperature in the producer is regulated, and steam also improves the calorific value of the gas produced.

Of course, air and carbon reacting give the formation of both CO_2 and CO; but the CO_2 passing through the incandescent coke gets broken up into CO.

$$CO_2 + C = 2CO.$$

Again steam and carbon at temperatures below 1832° Fahr. give CO_2, instead of CO.

$$C + 2H_2O = CO_2 + 2H_2.$$

The conditions required to enable us to get a gas containing the least quantity of CO_2 are a sufficient bed of fuel and a temperature of not less than 1832° Fahr. I find our best results are obtained by using 40 per cent. of steam (by weight) to every 1 lb. of carbon burnt. The formation of clinker is kept at a minimum; and CO_2 also is kept at a reasonable figure.

One side of our producer is cleaned every alternate morning; and fire is run through with a pinch three times weekly, and any clinker forming removed.

The following is an average sample of our producer gas during twenty-four hours.

CO_2	3·0	
CO	28·7	Calorific value = 128 B.Th.U.
H	10·7	
N	57·6	
	100·0	

The primary air used per pound of carbon burnt to give the above is 57 cubic feet at N.T.P.

Waste Gases.

By the combustion of the fuel gas shown before with the exact amount of secondary air—viz.,

$$\frac{CO_2\ 3{\cdot}0,\ CO\ 28{\cdot}7,\ H\ 10{\cdot}7,\ N\ 57{\cdot}6}{100\ \text{vols.}} + \frac{O_2\ 29{\cdot}7 + N\ 74{\cdot}1}{101{\cdot}8\ \text{vols.}}$$

$$= \frac{CO_2\ 31{\cdot}7 + H_2O\ 10{\cdot}7 + N\ 131{\cdot}7}{182{\cdot}2\ \text{vols.}}$$

The percentage composition is given of

$$CO_2,\ 18{\cdot}2;\ H_2O,\ 6{\cdot}1;\ N_2,\ 75{\cdot}7$$

While as tested, we generally expect to get 18 to 29 per cent. of CO_2.

Analyses of Gases.

Producer Gas.—The usual method is by the use of a Bunte burette. The CO_2 is absorbed by caustic potash; then the CO by cuprous chloride (hydrochloric acid solution); while the hydrogen is shown by combustion over heated platinum wire with excess oxygen when two-thirds of the contraction noted equals the hydrogen. The Hempel apparatus can be employed. The CO_2 is estimated as before; the residue being mixed with excess oxygen and exploded in a mercury pipette by an electric spark. The CO_2 formed is estimated when the CO_2 found = CO_1 and H_2—equal to two-thirds of the contraction due to CO.

Waste Gases.—Find the CO_2 and CO as before; and the O_2 by alkaline pyrogallic acid. I always use a Bunte burette for these tests. It is accurate to 0·2 per cent., which is all that is required. The CO and O_2 are the figures that are most carefully noted. The Orsat apparatus is used by many; but I always found it much slower. It is almost useless if a large percentage of CO is present in any sample, owing to the time taken for its complete absorption.

Sampling Gases.—We have two tin cans of a capacity of about ½-gallon. These are connected by rubber tubing at the bottom; and one is fitted with two cocks at the top. A length (say, 5 feet) of ordinary ⅜-inch iron tubing is put into the flue, and well clayed on the outside. This is connected by rubber tubing to one of the cans. The cock is opened; and on lowering the other can, the water runs down, and draws in the gas to be tested.

Temperatures.

These are obtained by various pyrometers. Perhaps the Fèry is the most handy and suitable for use in a gas-works. Seger cones can also be used; but personally I found them troublesome and not too reliable.

Temperatures of about 2500° Fahr. and above are impossible to judge by the eye, although practice enables one to tell those of 2300° Fahr. and under. Recording pyrometers are very useful. We have one of Messrs. Baird and Tatlock's, and use it in the lower flues of the setting when any variations during the 24 hours are noted.

Vacuums.

A King's water-gauge graduated in hundredths of an inch is used for all-over tests. It may not be so handy as some other gauges, but it can be absolutely depended on. The results are most important to the successful working of the retorts.

If between any point in the following table a difference is found, we know that the passage of gases is retarded at this point and steps are at once taken to remedy the trouble.

Vacuums.	One-Hundredths of an Inch.	Temperatures (Average). Degrees Fahr.
Setting—Top	0	2350
,, Middle	12	2010
,, Bottom	28	1620
Regenerator—Top	30	1330
,, Middle	42	—
,, Bottom (below damper)	57	530
Main flue (before damper)	70	—
Chimney	80	—
Secondary air—Bottom	14	—
,, Middle	11	—
,, Top	7	1190
Producer outlet	20	1650

At first when the retorts were working, we worked with ten-hundredths less vacuum on the main flue; but now we need the figure given. This was due to the flues in the setting being rather small and getting furred-up with working. This mistake, needless to say, was made right in the Dawsholm setting.

Working Conditions.

Primary air remains constant. Secondary air altered as required. This may be necessary, due to the efficiency of the producers. Vacuum of main flue is kept regular. I have a gauge fitted up at this point, so that it can be easily seen by the men on duty. They alter the damper as required. The coal drawn through the retorts depends upon the heat found in the setting. Should the heat be increasing, more is drawn, and *vice versâ*.

Waste Gases.

These are tested regularly, and never allowed to have more then 1 per cent. of CO or oxygen. I have seen it advocated to have CO passing from the setting and burning in the regenerators. This is entirely unnecessary at the Temple works. We have plenty of draught; and I like to see the waste gases pass away at as low a temperature as possible. As a rule I prefer to have CO in the waste gases, rather than O_2; but anything above 1 per cent. I look upon as needless waste of fuel.

Heating-up New Setting.

A small fire is put on the producer, well towards the back. The primary-air slide is slightly opened, and air drawn over the top of the fuel so as to burn all the CO to CO_2. The bed of fuel is gradually increased, and care is taken to burn all the CO completely. When the combustion chamber shows a high enough temperature to ignite the CO, the secondary air is admitted, and the heats are brought up to that necessary for carbonization.

The whole idea is the gradual bringing-up of the heats, and great care is taken that no fuel gas passes unburnt into the setting.

An oven can be heated much more quickly when going on for a second time, and could be making gas easily in ten days. Verticals cannot be brought into use as quickly as horizontals.

Hanging Retorts.

This may be necessary on Sundays. An extra draw is taken off all the retorts, and the damper reduced as is reckoned necessary. The quality of the gas made is watched; and if need be the gas is allowed to blow off.

Cooling-down the Setting.

The vacuum on the main flue is reduced 50 per cent., and the retorts are emptied. The primary and secondary airs are then reduced as necessary. Care is always taken to cool down slowly so that no damage is done to the brickwork.

Scurfing Retorts.

The heats are reduced by lowering the damper. The retorts are then completely emptied, and the door at the bottom opened slightly. The air rushes up and burns the carbon completely away, provided the temperature is not allowed to cool down unduly.

Dampers in Setting.

In the Temple setting we have six waste-gas dampers, which are adjusted to give as equal a temperature as possible in the waste-gas flues at the top section of the regenerators. The vacuums at the bottom of the regenerator naturally vary—being more on the outside flues than the inside; and the side furthest from the chimney needs a slight additional pull.

Figures to Remember.

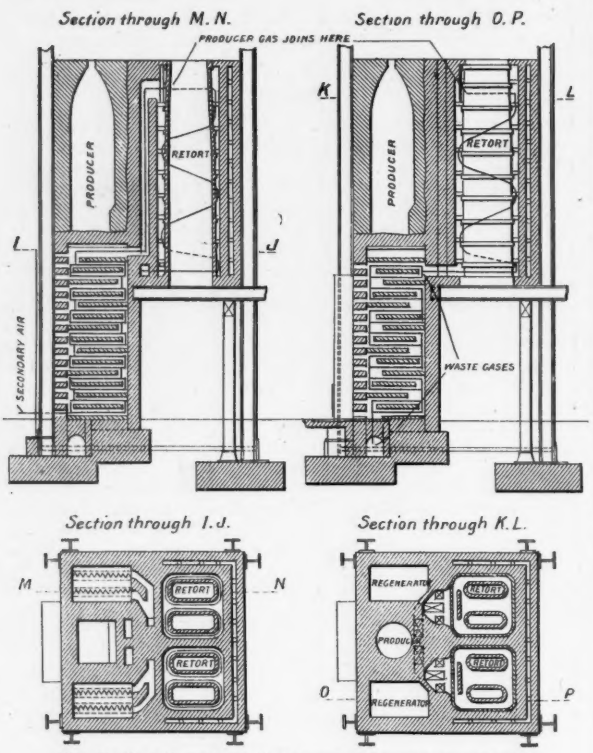
I would here like to call your attention to some interesting figures:—

1 lb of coal requires 462 B.Th.U. for its carbonization.
Heat lost in gas and vapours = 324 B.Th.U.
Lost in red hot coke (horizontals) = 442 ,,
∴ 1228 B.Th.U are required, or 8·6 lbs. of carbon, for 100 lbs. coal carbonized.

The losses due to radiation and convection, flue gases, and hot ash in horizontals without regenerators = 1884 B.Th.U. The total needed, 3112 B.Th.U. = 22 per cent. of coke by weight of coal. Horizontal regenerative settings brought the coke used down to 16 lbs. per 100 lbs. of coal = 1056 B.Th.U. lost for radiation, &c. Verticals have reduced the fuel account to 10 lbs. per 100 lbs. of coal = 1428 B.Th.U. per pound of coal.

The Glasgow Verticals.

I am not going into a description of the various forms of verticals—members of the Association have seen them for themselves. The verticals in Glasgow have also been described by Mr. Wilson in his presidential address to the Institution of Gas Engineers and by other gentlemen connected with the Glasgow Gas Department.



The Vertical Retorts at the Temple (Glasgow) Gas-Works.

But I have been looking over our daily report book, and can give you some figures that have been noted down. At Temple, of course, we always use one class of coal at a time, and the plant is used as a coal-testing one. The results are all with Scotch coal. We have used as much as 15 tons 10 cwt. of coal per day = 77·5 cwt. per retort. Our best day's make was 172,000 cubic feet of gas = 43,000 cubic feet per retort. Working with a temperature of 2500° Fahr. in a setting using 11 tons of coal, 132,000 cubic feet of gas are easily obtained. An increased amount of coal—say, 12 tons—will naturally lower the temperature of the setting; and getting 132,000 cubic feet of gas of better candle power is our most common practice. The ease with which one can command the quality of the gas produced by varying the amount of coal used is, to my mind, the greatest advantage of the Glasgow verticals. The coke consumption varies; but generally it runs at 16 lbs. per 100 lbs. of coal carbonized. Of course, this figure is high—due to the fact that we have only four retorts in the setting at Temple. The Dawsholm setting consists of six retorts, and shows a considerable saving in the fuel account.

DISCUSSION.

Mr. T. Carmichael (Glasgow), the Vice-President of the Association, said the paper furnished some interesting figures which proved to those engaged with settings that the inlets for the secondary air and producer gas must be equal. He would like to have opinions regarding the length of the flame and the control of it. When the secondary air in a setting which in the first place had been properly regulated was increased, was the length of the flame increased or decreased? He thought if they had a certain length of flame and a certain amount of secondary air, and increased the latter, they would have a shorter flame, while if they decreased the secondary air they would get a larger flame at the expense of a little waste of fuel. The temperatures of the waste gases going away to the chimney at Temple were certainly very low. Chimney draught was a matter of temperature.

Mr. G. H. M'Cowat (Glasgow) thought there was a tendency to put too many retorts to a producer merely to reduce the fuel account. This meant that if a producer had to be renewed or repaired all the retorts were laid up at the same time.

Mr. W. Wilson (Falkirk) thought the paper furnished some very interesting figures which would prove a valuable and handy addition to the "Transactions" of the Association. He should, however, like the author to look up one point. He thought Mr. Marwick was wrong in the 40 per cent. figure he gave regarding the quantity of steam required to get the best result for every pound of carbon burnt. If they took a perfectly efficient boiler, where they had the heat of all the fuel converted into steam, they would use 40 per cent. of the coke produced to provide the steam required for the producer. If they carbonized 20 tons of coal, getting 13 tons of coke, they would be using something like 3 tons in the producer. Taking an ordinary boiler with 50 per cent. efficiency, they might require another 3 tons to raise steam for the producer; getting only 7 tons for sale. In the sampling of the gases, he saw Mr. Marwick used two tin cans. He had long ago had experience with this method. He found there was considerable absorption of the carbonic acid gas by the moisture inside the cans. By the time they reached the laboratory, they would find there was a false result. He was particularly interested in draughts, and was delighted to see that they worked with such light draughts in their vertical retorts. At Falkirk they had a big chimney, with 1½ inches of pull; and they throttled this down. When they had trouble with short-circuiting regenerators, they sometimes had very fancy draughts. There was one thing he found—viz., that the heating of a setting depended very largely upon the quality of fuel that was being carbonized in the furnaces. The quantity of ash, but more particularly its composition, had a marked effect upon this. He thought one could have too many retorts to a producer—that was to say, an internal one. Where they had a setting of retorts superimposed above a producer, some of the retorts depended upon the producer arch; and this was the weakness of all horizontal settings.

Mr. D. Fulton (Helensburgh), the Hon. Secretary of the Association, referred to Mr. Marwick's remarks that putting an increased quantity of coal through the retort, and reducing the make per ton, gave gas of rather better illuminating power. If they wanted to get good candle power in vertical retorts, they required to have their heats as high as possible, and to put through as large a quantity of coal as they could. Then they had the candle power at its best. If they merely reduced the make of gas per ton, they did not get the same effect. He agreed with Mr. Marwick in his remarks on the Seger cones. They did not give very reliable results. The author did well to emphasize the necessity of a slight vacuum in the flues. Successful working of a retort-setting depended entirely upon this. He would like to know whether, if they took a fuel gas containing a stated proportion of carbonic oxide, and introduced exactly the amount of secondary air required for combustion, they would get a longer or a shorter flame than when they introduced an excess of secondary air. It seemed to him that if they had the exact amount of secondary air required at the point of combustion, the retorts in the centre would always be the best heated. If they had more secondary air, the heat was more evenly distributed over all the setting.

The President (Mr. John Wilson, of Falkirk) said he wished to know, with regard to Mr. Marwick's statement that in the setting he returned a certain percentage of carbonic acid to the producer, what the percentage was. With reference to the change of the secondary air, he presumed that Mr. Marwick had to do this on account of the different state of the producer. If it was dirty, there would not be so much primary air passing up. When the producer was clean, he would get more producer gas. He would require to open-up his secondary air ports, and completely burn up the extra producer gas.

Mr. Marwick, dealing generally with the questions, said the chimney temperature needed to be fairly high to get a good draught. He thought that about 600° was a temperature giving as good a draught as one could get. He should like to point out that if they had a large amount of secondary air the combustion would take place in a smaller area, and they would have local heating. If they had a smaller amount, the heating would be better distributed. He thought the more retorts they had to an internal producer (with safety) the better. Mr. Wilson was right in saying that the cans did not give quite satisfactory results. If they wanted good analyses, they would have to collect the gas over mercury. In reply to Mr. Fulton, with a high temperature like 2500° Fahr. it was difficult to get any larger amount of coal drawn through and still keep up the temperature. When they began to use more coal, their temperature went down. The President was, in his (Mr. Marwick's) opinion quite right in what he said in regard to secondary air.

Lighting and Health.—Presiding at the annual dinner of the Illuminating Engineering Society last Friday, Sir William Bennett, responding to the toast of the evening, said many persons thought that the excellence of a light lay in its intensity. They lost sight of the fact that too much light might do as much injury to health as too little. The lighting of schools provided a good object lesson. Too little light led to eye-strain and brain-fag, and all the evils consequent upon them; while too much light produced eye and brain irritation, headaches, neurasthenia, and the conditions resulting from the over-stimulation of such a delicate organ as the eye. Badly arranged lights might lead, in growing subjects, to the unequal use of the eyes, and cause bodily distortion, resulting in spinal curvature. Children often suffered from brain fatigue, which was ascribed to over-work, but was due really to the defective lighting of schools. It would be extremely interesting to ascertain what would be the effect of an inspection of the illuminating arrangements in schools upon the number of spectacles required by the children attending them. Illumination was as much a matter of true hygiene as was ventilation or any other sanitary measure.

RECENT DEVELOPMENTS IN DISTRIBUTION AT DUNFERMLINE.

By R. M. Simpson, of Dunfermline.

[From a Paper read before the Scottish Junior Gas Association, Eastern District, Feb. 7.]

At no time in the history of the profession which we follow has so much stimulus been given towards increasing the sales of gas as has been the case within comparatively recent years. The now established British Commercial Gas Association is doing comprehensive and useful work; many of the larger undertakings have at the head of their sales staff men specially qualified to forward the sales of gas on commercial lines; the lady lecturer and adviser has been introduced into the sales staff; and most gas concerns have realized more than ever the necessity for granting easy terms upon which gas appliances can be procured or hired. It therefore occurred to the writer that it may be interesting to give a short *résumé* of what has been done recently in Dunfermline towards pushing the sale of gas.

New Show-Room and Workshops.

About eighteen months ago, the lease of the old show-room and plumbers' workshops was about to expire; and it was considered at that time whether it would be advisable to procure a site and build a show-room and workshops which would belong to the Gas Department and be more in keeping with the growing importance of the town. This was decided to be done. The first thing that had to be tackled was the procuring of a suitable site. This was obtained at a fairly reasonable figure quite near the main shopping locality, and in the vicinity of many frequented public buildings. It is also situated in the centre of the town, and is thus most convenient for the general body of consumers. [The author gave a detailed description of the building.] In addition to the ordinary business of the show-room, it is also used for receiving complaints and for the payment of gas accounts. It is desirable to have the attendance of consumers at the show-room as often as possible, as it tends to acquaint them with the various methods of using gas.

Terms on which Apparatus is Supplied.

After the completion of the show-room, it was deemed advisable to amend the terms upon which the various appliances were lent or sold to the public. These were considerably reduced; and the increased business resulting therefrom has fully warranted these reductions. The following are the terms now given: Cookers, grillers, hot-plates, and rings, lent free of hire; fixed free. Fires are sold at 50 per cent. off list price, *plus* 15 per cent., fixed free. Special apparatus, at terms by arrangement. Incandescent fittings, burners, mantles, &c., are sold at reasonable rates, and fixed free. Special terms are granted to the trade.

High-Pressure Lighting.

That this form of lighting has proved highly advantageous to gas concerns is well realized, particularly in competing with electricity. We have found it so; and it has proved the means whereby we have retained several of the factories who were inclined to adopt the rival illuminant. The main thoroughfare and the street in which the show-room is placed are lighted by means of Keith high-pressure lamps, each giving a light of 1500-candle power.

High-Pressure Distribution.

At the 1908 meeting of the North British Association of Gas Managers, Mr. Alex. Waddell submitted a paper dealing with a high-pressure main which had been laid to supply several districts to the south of the town.* The compressing plant was further described in a paper read the following year.† The plant has been in use night and day for the past six years, and during this time not the slightest trouble has been given. A 5-inch high-pressure main, seven miles long, has recently been laid to supply the rapidly developing districts to the west of Dunfermline. The mining industry, especially at Valleyfield and Blairhall, and the Government Ordnance Works, at Crombie, have given a great impetus to the growth of this district; and the population is rapidly increasing. Although the gas has only been turned on for one year, the daily increasing consumption has fully justified the enterprise of the Council. The main is laid on much the same lines as that described in Mr. Waddell's papers already referred to; the same compressing plant serving to boost the gas to both districts.

One special feature of the main is the form of combined syphon-box and testing apparatus used. The discs, which are faced with rubber and suspended by means of a wedge, are dropped in between the ends of pipes within the box, and pressed home by driving the wedge. To prove their tightness, they are surrounded by water; so that gas or air under pressure escaping from the pipes under test would bubble through the water and so be readily observed. It therefore makes an absolutely reliable valve. [The appliance here referred to formed the subject of a patent taken out in 1912 by Mr. Alex. Waddell—see illustrated abstract in the "Journal" for Dec. 10, 1912, p. 832.]

In concluding this brief summary of the recent developments in distribution at Dunfermline, I would like to emphasize the great adjunct an artistically designed, properly-kept, and well-managed show-room is as a means towards increasing the sales of gas. I submit the following statement, which shows the development in the sales of gas for the past ten years:

Year ending May 15.	Gas Consumption. Cubic Feet.
1904.	99,205,000
1909.	116,118,000
1912.	135,684,000
1913.	149,534,000

DISCUSSION.

Mr. J. B. Scott (Cowdenbeath) spoke of the pioneer work in Scotland done in the matter of high-pressure distribution by Mr. Waddell. He said he believed Mr. Waddell was sending gas under pressure as far as seven miles from the gas-works. He (Mr. Scott) had said, some years ago, that it would not be long before a booster would be as common in gas-works as an exhauster; and he thought that the time he then prophesied about was now very near at hand. He congratulated Mr. Waddell on his very complete arrangement of show-room and workshop, and Mr. Simpson on the clear description of the building contained in his paper.

Mr. A. Waddell did not like to say too much about the details of the building, as he had been responsible for them; but he would like to refer to the heating of the show-room by a single gas-fire in one corner, which gave such good results and even heating that there were only one or two degrees difference in heat at any part of the room, which was a large one. He attributed this to the removal of all stoves and apparatus from immediately in front of the gas-fire; so that the radiant heat could proceed directly out from the fire, and heat the opposite walls. He thought that these heat rays were too frequently impeded and stopped from doing their full work by the indiscriminate placing of many objects about the floor, and so preventing the heat from being properly diffused.

Mr. R. B. Chalmers (North Berwick) remarked that he would remember the excellent plan described, of making the customers pass through the show-room before they reached the office, so that they must see the latest apparatus for using gas. He said that a new show-room had been long contemplated in North Berwick, and would soon be, he hoped, an accomplished fact. He had found that their office had been heated with a coal-fire, and when a customer had pointed this out, he had at once removed the coal-fire and substituted a gas-fire of the latest type. He thought that the paper before them would be of help to those, like himself, contemplating new show-rooms.

Mr. Henry O'Connor (Edinburgh) mentioned that at Portsmouth, where he had been recently lecturing to doctors and architects on the hygiene of modern gas-fires, he was informed that the Portsea Island Gas Company intended to pull down the handsome building they at present occupied, and build a new set of offices and show-rooms, so that the public would have to do what Mr. Waddell had already made them do in Dunfermline—namely, pass through the show-rooms to the office, instead of the reverse, which now obtained. He (Mr. O'Connor) referred to the necessity of heating the walls of rooms, so that they, and the floor and other objects receiving the radiant heat, should in turn give off the heat they received in the form of convected heat at low temperatures. He pointed out that, at high temperatures, convected heat made the air hungry for moisture; and this it was which made the convected form of heat objectionable. Convected heat was, however, necessary; so that the air of a room should be heated when the stove was first lighted.

* See "Journal," Vol. CIII., p. 308. † Vol. CVII., p. 325.

Scottish Junior Gas Association (Western District).—We learn from the Hon. Secretary (Mr. David Fulton, of Helensburgh) that the members will next Saturday visit the Granton Gas-Works of the Edinburgh and Leith Corporations Gas Commissioners, of which Mr. A. Masterton is the Engineer and Manager. At the meeting on the 7th prox., Mr. T. G. Moffat, of the Tradeston Gas-Works, Glasgow, will read a paper on "The Repair and Maintenance of Gas-Works Plant;" and a fortnight later the members will visit the Uphall Oil-Works of Young's Paraffin Light and Mineral Oil Company. The annual general meeting will be held on the 11th of April, and Dr. W. B. Davidson will deliver a lecture, which will be followed by the annual dinner.

Professor Harold Dixon and Explosions in Mines.—Experiments on the prevention of explosions in mines were described and shown in a lecture given by Professor Harold B. Dixon, Ph.D., F.R.S., at Manchester University on Monday last week. The lecturer described the station at Eskmeals where he and his staff conduct experiments with a view to finding how mine explosions arise, and how they may be prevented. Repetitions in miniature of the experimental explosions were given from time to time to illustrate the lecturer's points. Among recent experiments described was that of testing the effect of adding an "inner" dust to the coal dust; and Professor Dixon said the experiments had given hopeful results. It was exceedingly unlikely that if there was to be a "1 to 1" mixture of inner dust and coal dust that it would be lighted by any ordinary blown-out shot, or even by small gas-flames.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The South Metropolitan Staff and Gas Testing.

SIR,—There is a juxtaposition of reference in the principal leader of your current issue which may be susceptible of misinterpretation if left uncorrected. I allude to the suggestion that the "illuminating power test is a pernicious and unreliable one, and was by no one assailed with greater vigour than by the late Sir George Livesey and the staff" of this Company. This does not quite describe the purport of our opposition, which was against the practice of making photometrical tests of the gas supply under unsuitable conditions.

If a case for calorific testing can only be supported by calling photometry an inexact science, it must be a very weak one; but to speak of it as pernicious and unreliable is, I suggest, going too far; and I hasten to disclaim sharing those views on behalf of myself and the staff of this Company.

As a matter of fact, the investigations required by photometry, are, if carried out with suitable apparatus and surroundings, no less exact than deductions in other branches of science where controversies still linger—even calorimetry.

CHARLES CARPENTER.

South Metropolitan Gas Company,
709, Old Kent Road, S.E., Feb. 14, 1914.

[Time, of course, may change the opinions of men. We do not think the statement is untrue that the illuminating power test was by no one assailed with greater vigour than by (the late) Sir George Livesey and the staff of the South Metropolitan Company; nor do we consider it necessary to wade through the history of gas-testing in the Metropolis to show that this was at one time the case. But if we just peep in a volume of the "JOURNAL" for 1896, we find the late Chairman of the Company saying that "light cannot be measured with anything like the exactitude of weight or length." If we look into a number in 1900, we find him remarking that the photometrical examination of gas is not an exact science. The evidence before Lord Rayleigh's Committee in 1904 has only to be examined to see how actively it was urged upon the Committee that illuminating power test results depended much upon instruments and persons. Mr. Carpenter says that "*if* a case for calorific testing can only be supported by calling photometry an inexact science, it must be a very weak one." That is the first intimation we have had that anyone has suggested building a case for calorific testing on the simple plan of calling photometry names. There is no necessity to do this; there is much else to supply material for a case. The evidence of Mr. Carpenter before Lord Rayleigh's Committee in 1904 contains some pertinent points:

2611. LORD RAYLEIGH (Chairman): Would it strike you as an advisable thing that there should be regular tests executed of the thermal value of gas supplied in London?

Mr. *Charles Carpenter:* I have no objection to that if they are not made penal. The companies are in the position now that they must make and send out what is best for the consumer; otherwise they would not get his business, which is the reason of their existence. *We have suffered so much anxiety and worry from penal tests in the past* that I have personally a very strong objection to their continuance in another form. . . .

2614. Mr. MOULTON: His Lordship suggests that a series of tests should be made for information, in order to discover whether the calorific test was a more valuable one than the test for illuminating power. You would not object to a calorific test being substituted, after due warning, for the illuminating test?

Mr. *Carpenter: No, provided it were one wherein we could keep without any difficulty.*

2615. The CHAIRMAN: At present we are in this position, which weighs rather strongly upon my mind; that the illuminating test is made under rather artificial and unpractical conditions; it is made in a burner which is scarcely used at all in practice, and the actual value of the gas seems to depend firstly upon its calorific value—perhaps almost principally now—at all events, secondarily, and on its value in a flat-flame burner; and neither of those are directly tested under the present system?

Mr. *Carpenter:* I quite appreciate that, but with regard to the flat-flame burner *I would point out that the use of that is diminishing very rapidly.*

2619. Mr. MOULTON: You may say that, practically, they [flat-flame burners] have been killed by the incandescent?

Mr. *Carpenter:* Yes. *All forms of using gas for the purpose of illumination have been practically killed by the incandescent.*

2626. The CHAIRMAN: The inference from that would be that in the future it may be only the thermal value that need be considered at all?

Mr. *Carpenter:* I think in the future it will be thermal value and not light-giving value that will have to be considered.

This is all interesting at the present time; and the conditions have been continuously changing during the ten years that have since elapsed.—ED. J.G.L.]

A Middleton Proposal not Confirmed.—A resolution of the Gas Committee was, at the last meeting of the Middleton Town Council, put forward for confirmation, which stated that "consumers who have gas-cookers installed free of charge must consume gas to the value of at least 20s. per annum." The proposition found several supporters; but on the suggestion of the Town Clerk, the minute was taken back. The Town Clerk said he did not think the Council were doing what was quite within their rights in passing the resolution.

REGISTER OF PATENTS.

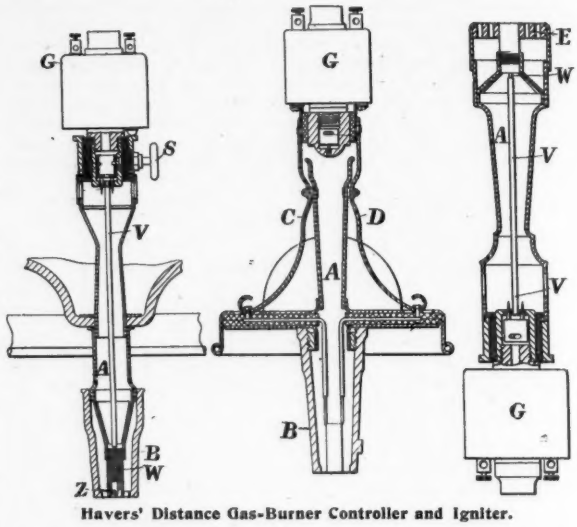
Distance Gas Lighting.

HAVERS, E. W., of Highgate, N.

No. 28,653; Dec. 12, 1912. No. 16,110; July 12, 1913.

This combined invention relates to distance control ignition of gas-burners by electrical igniting devices.

Two forms are shown of the arrangement as applied to an inverted burner, and one to an upright burner.



Havers' Distance Gas-Burner Controller and Igniter.

G is a casing containing a valve device for controlling the admission of gas, and below is a regulator or nipple consisting of an inner part having a number of holes furnished with tapered needles arranged each to enter or recede from its hole—thus regulating the opening of same. The needles are carried by a small cup, which is raised and lowered by a crank-pin acting when the button S is turned. The outer part of the regulator is electrically insulated from the inner part, and to the latter part is attached a central conductor rod V, which extends downwards (or in an upward direction in the case of the upright burner) and is connected at the lower end to the central tube W of the igniter device by sliding therein or thereon. The tube W (diverted from the central line as shown) passes through an insulating block contained within an outer metal tube, and receives one end of the platinum igniting coil or filament Z; the other end of the latter being similarly held in a short metal tube partly embedded in the insulating block but in electrical contact with the outer tube.

On gas being admitted through the valve, it passes with a quantity of air down the mixing tube or chamber A to the nozzle B, where it is ignited by the incandescent coil or filament Z, which is rendered incandescent by a current of electricity passing from one of the terminals of the valve-actuating device, through the central insulated metal portion to the regulator or nipple, and thence by the central conductor rod V to the central tube W of the igniter, and through the filament Z, rendering it incandescent. The current leaves the other end of the filament and passes through the mixing tube or chamber A to the other terminal.

In the second burner illustrated, the mixing-tube A and the burner B (to avoid direct conduction of heat) are connected to flanged extensions with layers of insulating material between them. In this case, the electric conductors C D may be entirely external, and be formed of depending members as shown; the current from them being led into the nozzle P through the screws shown.

In applying the central conductor rod V to an upright burner, the igniter-tube is disposed centrally of the burner proper E, and the valve casing G and its actuating parts are arranged at the lower part of the burner fitting. In other respects the construction is on the same lines as that described for the inverted burner.

Coal-Tar Distillation.

ROSEN, J., of Maplesbury Road, N.W.

No. 28,972; Dec. 16, 1912.

In order to facilitate the distillation of the constituents of coal tar, the patentee points out a current of steam or air that acts as a carrying medium is usually passed into the heated mass of tar during distillation. It has also been proposed to first mix the tar with a suitable diluent, such as naphtha, and then distil with a current of air or steam; and in some cases to mix tar or pitch with a volatile solvent, in order to separate free carbon, and then distil the remaining mixture of tar and solvent. Heavy residual coal tar has also been distilled with hydrocarbons, such as creosote oil, introduced towards the end of the distillation, in order to drive off anthracene without spoiling the remaining pitch; and light hydrocarbons, such as benzene, have been introduced into mineral oils, in a liquid or vaporized condition, so as to facilitate the distillation of the oils.

The present invention has, he says, shown that it is only possible to satisfactorily improve the distillation of coal tar and keep the light oil introduced for this purpose within reasonable limits, if the oil is supplied at a considerably lower temperature and the tar is heated

before the light oil is introduced. "Unless the tar has been preheated, and unless a very considerable difference exists between the temperature of the cold oil introduced and that of the heated tar, the distillation will not be substantially improved—that is to say, unless these conditions are observed the whole plant, as well as the distillates, will merely be encumbered with a large amount of volatile oil."

On being passed into the receiver or vessel in which the tar is heated, this cold liquid mixes with the tar; and as it is subsequently converted into gas or vapour, it dissolves the vapours formed by the material that is to be distilled and carries these vapours over into the distillate.

What he claims as his invention is: (1) The distillation of coal tar and like hydrocarbons by progressively introducing into the tar, on having heated the same to an adequate temperature, a volatile solvent at a considerably lower temperature, and that boils at least 80° C. below the product to be distilled and that by its subsequent evaporation will carry over the heavy constituents of the tar and like material so as to facilitate distillation. (2) The distillation of coal tar or like hydrocarbons according to claim 1 by introducing into the heated tar throughout the distillation a volatile solvent at a considerably lower temperature that acts as a carrier, and then condensing the volatile solvent, after having, by condensation, separated off the distilled constituents of the tar or mass to be distilled; the volatile liquid being subsequently led back to the still so as to form a continuous cycle.

Reference has been directed by the Patent Office authorities to the specifications of patents No. 1980 of 1880, and No. 1411 of 1898.

Converting Coal-Tar Residues into Pitch.

ROSEN, J., of Maplesbury Road, N.W.

No. 28,973; Dec. 16, 1912.

This invention relates to the process described in patent No. 8712 of 1912, for converting coal tar into pitch. It consists in converting a part only of the constituents of the raw material into pitch; the other constituents being left in the form of oils.

It may be of advantage under certain circumstances, the patentee mentions, to convert some of the constituents only of coal tar into pitch and leave the others unconverted. The market for these products may, for instance, be such that the price quoted for naphthalene oils and naphthalene contained in the coal tar is lower than the price of pitch, whereas other constituents of the tar (such as anthracene oils) attain the same price as pitch. In such case it will, of course, be of advantage to obtain, in addition to the pitch, as high a yield as possible of the more valuable constituents of the raw material.

The process is carried out, as explained in the earlier patent, by using apparatus comprising several columns; but the vapours or gases that escape from the columns at different temperatures are condensed and collected separately. The constituents that are to be completely converted into pitch are passed back into the mass of raw material under treatment by returning them to one of the following columns, whereas the other constituents are left in the condition in which they are collected.

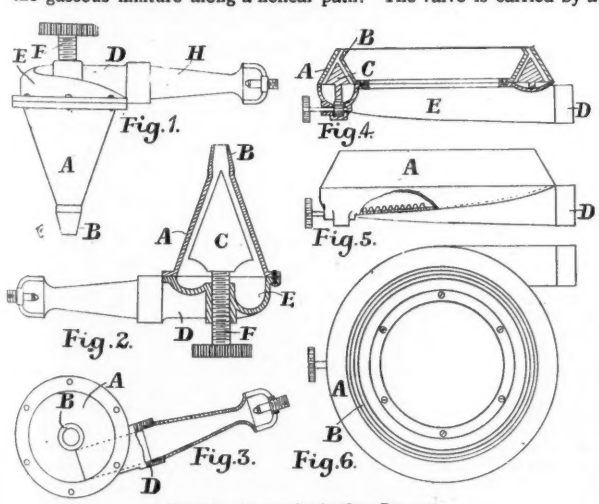
When it is desired to convert all the constituents of the material (except for instance one or two) into pitch, the coal tar or tar oils are heated and treated with air until these constituents have been completely separated off from the others that are to be converted into pitch, whereupon the vapours that continue to be given off are returned to the mass of tar and passed into a subsequent column for renewed treatment.

Atmospheric Gas-Burners.

TOOTH, L. F., of the Commercial Gas Company, Stepney.

No. 1771; Jan. 22, 1913.

According to this invention, the burner comprises a conical casing forming a mixing-chamber fitted with a conical valve and provided with a tangential inlet pipe somewhat in the manner of the lighting burners described in patent No. 29,163 of 1910. The inlet pipe, however, is led into the base of the conical chamber and in a helical or inclined path, so as to merge gradually into the chamber and direct the gaseous mixture along a helical path. The valve is carried by a



Tooth's Atmospheric Gas-Burners.

screwed rod working through a screwed hole or bush in the base of the mixing-chamber, so as to adjust the position of the valve, which consists of a hollow conical block provided with a base portion moving with the valve or terminating in a cylindrical portion working in a corresponding recess or chamber formed in, or attached to, the base of the conical mixing-chamber.

When the burner is in use, the gaseous mixture entering the burner has a whirling motion imparted to it owing to the tangential inlet, and which "overcomes any tendency to strike-back, and allows of a much larger and hotter flame being produced."

Referring to figs. 1 to 3, the burner comprises a conical casing or mixing-chamber A, terminating in a nozzle B, and provided with a conical valve C. The gas inlet D is arranged tangentially with respect to the chamber, and merges gradually into its end E, as shown, in a helical or inclined path. The end of the chamber is formed by a separate cap in which the inlet D is cast. The valve C is carried by a screwed rod F passing through the cap E and fitted with a milled head, by which the flame is regulated. A bunsen tube is screwed into the inlet.

In the burner here shown the inlet D and the bunsen tube extend at right angles to the axis of the burner; but in that shown in the "JOURNAL" for Feb. 3, p. 293, the inlet is turned so that the bunsen tube lies parallel to the axis of the burner. This is said to be of advantage in certain cases.

With the improved burner, the gas entering the mixing-chamber has a whirling motion imparted to it owing to the tangential arrangement of the inlet. Further, in view of the way in which the inlet merges into the mixing-chamber, the gas is caused to travel in a spiral or helical path, and, owing to this, "the gas and air are thoroughly intermixed without unduly retarding the flow; also there is no risk of back-firing." A much larger and hotter flame can also be produced.

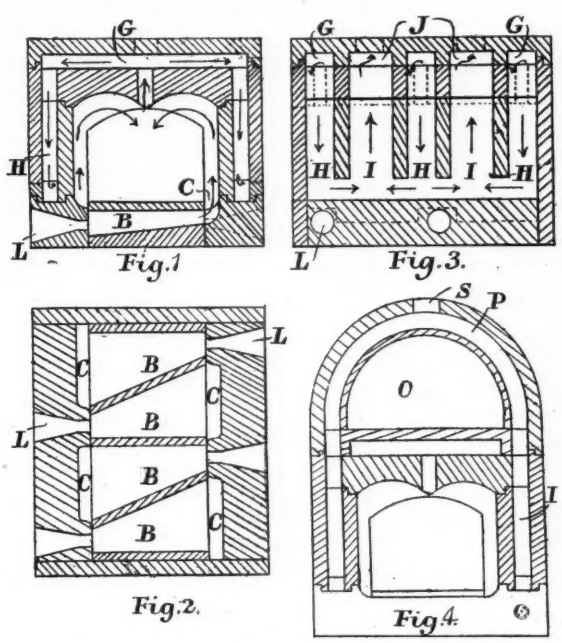
In the modified burner shown in figs. 4 to 6, the chamber A is annular, and the valve C is in the form of a ring. The inlet tube D enters the end E of the burner in the same manner as before.

Gas-Fired Furnaces or Kilns.

TOOTH, L. F., of the Commercial Gas Company, Stepney, E.

No. 1772; Jan. 22, 1913.

This invention relates to gas-fired furnaces or kilns for glass bending, enamelling, annealing, case-hardening, and the like purposes. It comprises a construction of furnace "whereby the loss of heat due to radiation is reduced to a minimum and the heating rendered uniform, improved means for heating the furnace, and an improved arrangement of annealing chamber in conjunction with the furnace."



Tooth's Gas-Fired Furnaces or Kilns.

Fig. 1 shows a front sectional view of the furnace; fig. 2, a sectional plan; and fig. 3, a side sectional view. Fig. 4 shows a front sectional view of the furnace when fitted with an annealing chamber.

The furnace is constructed with a heating chamber running from front to back, beneath which are arranged combustion chambers B communicating with the chamber above through openings C at the sides. The heating chamber is formed with a double arched roof along the centre of which a number of outlets are arranged to lead into horizontal flues G running from side to side of the furnace and communicating with vertical flues H which pass downwardly outside the heating chamber, and lead into ascending flues I disposed between the flues H, and leading into horizontal flues J disposed between the flues G and provided with outlets leading to the chimney.

When the furnace is in operation, the heated products from the combustion chambers pass through the openings C and vertically up the walls of the heating chamber; being then deflected downwards by the roof, and finally escaping. Owing to the form of the roof, a much larger heating effect is said to be obtained. Further, owing to the form and arrangement of the flues G, H, I, the spent products from the heating chamber are "utilized to heat the walls of the furnace and thereby reduce to a minimum the loss of heat by radiation."

For firing the furnace a number of combustion chambers B are employed, of the kind which are isolated from each other by partitions C and fired alternately from opposite sides of the furnace, and in which

the chambers diverge from the burner openings L. The base of each chamber B is sloped upwardly from the corresponding burner opening, so that the cross-section of the chamber diminishes slightly from the burner opening, with the object of imposing a certain amount of resistance to the combustible mixture, and thereby ensuring better combustion. The amount of the slope will depend upon the nature of the gas employed.

A further feature of the invention consists in forming each of the transverse combustion chambers B with one wall running transversely across the furnace and one oblique wall, so as to utilize the whole of the available floor space for heating purposes. This will be clearly understood on reference to fig. 2, showing that the combustion chambers extend right to the end walls of the furnace.

In some cases, an annealing chamber O (fig. 4) may be disposed above the heating chamber. This is heated by the waste gases passing from the flues I, which are led into a space P between the outer wall of the chamber and an inner shell. Outlets S are provided in the top of the wall leading to the chimney.

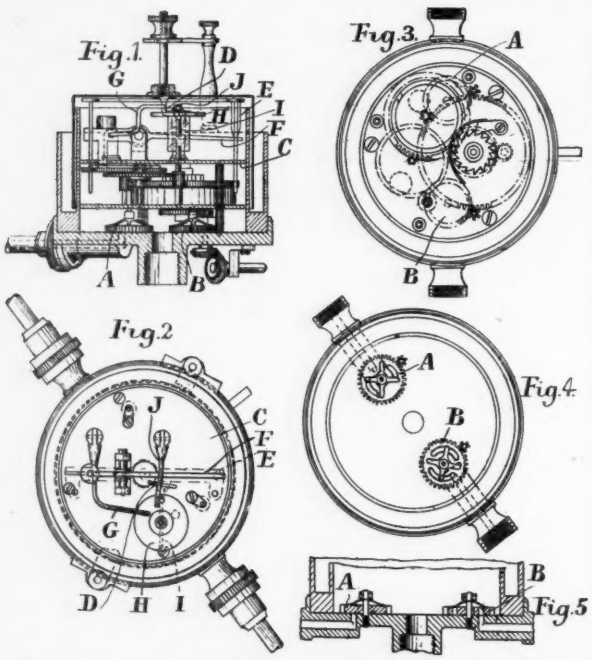
Automatic Street Lamp Gas Lighting and Extinguishing Device.

YOUNG, F. B., and PARKINSON AND W. & B. COWAN, LIMITED, of Edinburgh.

No. 2640; Feb. 1, 1913.

This invention relates to automatically acting devices for lighting and extinguishing gas-lamps, working on the "wave" system.

The gas-valves are so arranged that, at the first increase of gas pressure and raising of the bell, the clockwork is liberated and operates to open the main gas supply to the burners and close the bye-pass supply; and, when this has been done, a lever comes into action and automatically stops the clockwork mechanism and the valves. When the gas pressure falls again to the normal and the gas-bell descends, a device in connection with the bell acts on the lever and causes it to release the clockwork mechanism; while the controlling mechanism is brought again into position for a re-start. Thus, at the next increase of gas pressure and rise of the bell, the clockwork mechanism will be again started so to operate the valves as to cut off the main gas supply to the burners and turn on the bye-pass supply; whereupon it would again be stopped, and then, at the subsequent fall of gas pressure, be re-set.



Young's (Parkinson and Cowan) Lamp Lighting and Extinguishing Device.

Fig. 1 is a view of one form of the apparatus showing the tank and bell and their accessory parts in vertical cross-section, but the internal mechanism in elevation; fig. 2 is a plan with the bell and its accessories removed; fig. 3 is a plan view simply showing the details of the clockwork mechanism—the other parts being removed; fig. 4 is a plan view, and fig. 5 a cross-section showing the valve arrangement.

The device has two rotary valves A B for the control of the main gas supply to the burners and for controlling the bye-pass supply. Both can be operated simultaneously by clockwork mechanism driven by a spring or other source of power. In connection with the gas-bell shown there is a plunger bar having depending plunger rods, working in guide-holes in the horizontal partition plate C of the tank. Depending from the bar is a cranked arm D and a straight arm or pin E. This arm at its lower knife-edged end bears on one end of a lever F, secured to the partition C, and normally holds it depressed against the action of a weight at the opposite end of the lever, which end has a flat and downwardly projecting pin working through a slot in the partition, and adapted to engage a recess in one of the wheels of the clockwork mechanism. Bearing on, or passed, as shown, through a slot in the lever F is an arm G (the "stopping" arm), which is pivoted in a pillar on the partition, and whose free end is bent so as to be capable of engaging an upstanding pin on the disc of the fly I, and thereby stop the clockwork. There is a second arm (the "starting" arm) J secured to the partition, and which is, or may be, weighted (or spring pressed) so as to normally rest on the disc H and engage the pin on it. This arm is lifted out of engagement with the pin by means of the cranked arm D each time the bell rises.

The apparatus is so arranged that, whenever an increase of pressure takes place, it raises the bell and arm D, thereby lifting the starting arm J out of engagement with the pin on the disc H, and allowing the clockwork to run (under the action of its spring), thereby actuating the valves A B, which are in gear with the clockwork. The mechanism may be so arranged that both valves are rotated through a partial revolution sufficient to open the gas supply to the burners and cut off the bye-pass supply; and, when this has been done, the stopping arm G falls into engagement with the pin of the fly-disc H, and stops the clockwork. As the pressure assumes the normal, the arm D and re-setting pin E again assume the normal position; and in doing so the pin depresses the right-hand end of the lever F and raises the arm G, thus freeing the clockwork mechanism, which latter is now held ready for a restart simply by means of the starting arm J, which now again (owing to the fall of the bell) engages the pin on the disc H. A second increase of pressure will again raise the arms, and the clockwork will restart and will rotate the valves to a further extent sufficient to close the main gas supply to the burners and open the bye-pass supply; and when this has been done, the arm G will again engage the pin and stop the clockwork mechanism.

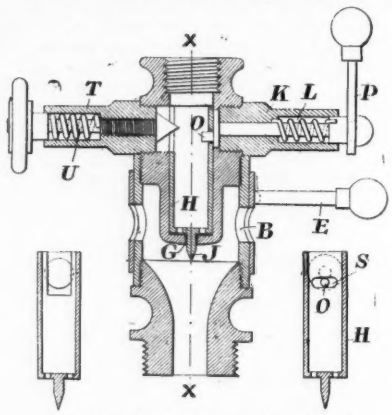
Where the device is fitted in connection with a lamp having a number of burners, the mechanism may be arranged in such a manner that, at the first actuation, the valves will move to an extent sufficient to open the gas supply to all the burners and at the second actuation will cut off the gas supply from some of the burners without affecting the supply to the others; while at a third actuation they will cut off the supply from all the burners. Or the arrangement may be such that, at the first actuation, the supply to some of the burners may be turned on; at the second actuation, the supply to the remainder of the burners may be turned on; at a third actuation, the supply to some of the burners may be turned off; and at a fourth actuation, the supply to all of the burners may be turned off.

Regulators for Gas-Burners.

ANDERSON, D., of Farringdon Road, E.C.

No. 4519; Feb. 21, 1913.

This invention consists in a gas-regulator having a hollow plunger carrying a needle, which serves as a gas-regulator and nipple cleaner—such plunger being adapted to be reciprocated against the action of a spring, for cleaning the nipple by a rotating crank pin on a shaft arranged transversely to the regulator body, while its movement under the action of the spring is limited by a stop which is moved relatively to a slot in the plunger to give any desired gas adjustment.



Anderson's Gas-Burner Regulator.

A cross-sectional elevation is given of a combined gas and air regulator and cleaning device for inverted gas-burners; also sectional views through the plunger looking right and left of the central line X.

The body piece, having air-ports B, is surrounded by an air-regulating sleeve, also provided with ports and having an arm E projecting from it to facilitate adjustment. Into the body there screws a piece having a bore down its centre, the end of the bore terminating in a nipple hole G. Within this bore there reciprocates a plunger H, carrying at its lower end a needle J, adapted to enter the nipple hole for the purpose of adjusting the flow and cleaning the hole. Two screwed apertures are provided in the sides of the body carrying the plunger. Into one of them is screwed a sleeve K, bored with a small hole for a part of its length and a larger hole L for the remainder of the length. In the small bore there is a spindle carrying at its end a plate from which a pin O projects. The other end of the spindle carries an arm P provided with a non-conducting handle. In the enlarged bore of the sleeve there is placed a spiral spring, having its ends bent parallel with the axis of the spindle. One of these bent ends passes into a hole bored at the bottom of the enlarged bore of the sleeve, and the other end engages a hole in the boss of the arm. The spring thus tends to return the arm to its original position when the shaft is rotated; and it at the same time exerts an axial thrust, in order to pull the plate carrying the crank pin upon its seating, so as to ensure a gas-tight joint. The sleeve screws into one of the holes in the body carrying the plunger, as shown at the right-hand side of the diagram, in such a manner that the pin O engages a slot S in the plunger H, so that rotation of the shaft reciprocates the plunger.

The mechanism here described is for the purpose of cleaning the

nipple hole. But, in order to adjust the gas supply, means are provided to limit the opening travel of the plunger; so that, on releasing the arm of the cleaning shaft, the plunger will always return under the action of the spring to a predetermined position. These means comprise a second sleeve T adapted to screw into the other hole in the body part. It is provided with a large and small bore; the small bore being provided with a fine screw-thread. A spindle U is adapted to screw into the small bore, and carries at its inner end a cone head; while a spring is provided in the enlarged bore, adapted to exert a thrust on the boss of a heat insulating wheel or the like secured to the outer end of the spindle. The thrust of this spring keeps the backlash of the screw always in one direction, and thus ensures gas-tightness. By rotating the spindle, the coned head is projected more or less into the path of the plunger; a suitable notch being cut in the plunger to permit the entrance of the cone.

It will thus be seen, that by rotating the spindle, the cone is protruded or retracted more or less into the path of the plunger—thus adjusting the position of the tapered part of the needle in the nipple. At any time that it is desired to clean the nipple, a movement of the cleaner arm P reciprocates the plunger to protrude the needle completely through the nipple hole, thus clearing away any obstruction, when, on releasing the arm, the plunger returns to its previous position.

APPLICATIONS FOR LETTERS PATENT.

Application for Restoration of Lapsed Patent.

Notice is given that Harry Wilson has made application for the restoration of the patent granted to Henry Howell for "An improved incandescent burner cluster for inverted lighting," No. 20,286 of 1905, and bearing date Oct. 7, 1905, which expired on Oct. 7, 1912.

2633.—Barralet, T. E., and the Parkinson Stove Company, Limited, "Water-heaters." Feb. 2.
2640.—Tooth, L. F., "Gas-burners." Feb. 2.
2649.—Moore, Q., and the Dowson and Mason Gas Plant Company, Limited, "Gas-producers." Feb. 2.
2650.—Moore, Q., and the Dowson and Mason Gas Plant Company, Limited, "Treatment and recovery of tar and ammonia liquor from gas." Feb. 2.
2651.—Moore, Q., and the Dowson and Mason Gas Plant Company, Limited, "Evaporative heat-exchanger for use in connection with producers or retorts." Feb. 2.
2652.—Julius Pintsch, "Prepayment meters." Feb. 2.
2667.—Silvester, N. L., "Intensifying gaslight." Feb. 2.
2713.—Shaw, J. A., "Globe holders." Feb. 2.
2732.—Wade, H., "Gas cooking-stoves." A communication from the Oxygenated Stove and Heater Company, Limited. Feb. 2.
2841.—Williams, P. E., "Treatment of sulphocyanides." Feb. 3.
2866.—Gibbons Bros., Limited, and Masters, R., "Furnaces." Feb. 4.
2904.—Levy, L. A., "Gas-fires." Feb. 4.
2937.—Townsend, W. W., "Geysers." Feb. 4.
2949.—Tooley, H., "Gas-driven pumps." Feb. 4.
2952.—Hunt, E. J., and Gidden, W. T., "Treating sulphate liquors." Feb. 4.
2953.—British Cyanides Company, Limited, Rossiter, E. C., and Robinson, C. S., "Manufacture of ammonium sulphate." Feb. 4.
3027.—Stimson, E. F., "Safety locking-devices for cocks." Feb. 5.
3032.—Stephenson, J., "Gas-recording apparatus." Feb. 5.
3127.—Jones, F. J. C., "Gas-furnaces." Feb. 6.
3132.—Sharp, W. Y., "Gas-heaters." Feb. 6.
3133.—Blair, R. H., "Gas-burners." Feb. 6.
3156.—Kitson, A., "Incandescent light." Feb. 6.
3157.—Fallot Incandescent Light Company, Limited, and Lowe, W. H., "Attachments for lamps." Feb. 6.
3159.—Carpenter, C., "Gas-fires." Feb. 6.
3160.—Carpenter, C., "Backings for gas-fires." Feb. 6.
3174.—Bamback, A., "Extracting sulphurous acid and oxides from sulphates." Feb. 6.
3175.—Bamback, A., "Producing synthetic ammonia by means of gas-generators." Feb. 6.
3188.—Stennulat, P., "Acetylene generators." Feb. 6.
3189.—Pinkerton, C. E. H., and Stocks, H. B., "Incandescent burners." Feb. 6.
3216.—Julius Pintsch, "Prepayment meters." Feb. 6.
3218-9.—M'Kinnie, E. C., "Reflecting devices." Feb. 6.
3252.—Eisner, S., "Controlling a source of light." Feb. 7.
3297.—Carpenter, C. C., "Gas-fires." Feb. 7.
3300.—Junkers, H., "Water-heater." Feb. 7.

Gas, Water, and Electricity Extensions at Rhyl.—A Local Government Board inquiry was held at Rhyl last Tuesday, as to the Council's application for sanction to borrow £5942 for the extension of the gas, water, and electric light undertakings. There was no opposition. The Town Clerk mentioned that while the town debt was £248,934, they owned the gas, water, and electricity works, and the rates had been reduced by 8d. in the pound during the past year.

Kingstown Electric Lighting Schemes.—In connection with the rival schemes for the electric lighting of Kingstown—those of the Alliance and Dublin Gas Consumers' Company and of the Dublin and Southern District Electric Supply Company—the Kingstown Urban District Council, at a special meeting last week, had before them a motion to rescind a resolution approving of the Southern Company's Bill and favouring opposition to it, at the same time suggesting an arrangement with the promoters to take over the Company's right to light the township and arrange provisional terms. On a division nine voted for the resolution and seven against; but the motion was declared lost, on the ground that a two-thirds majority of sixteen, the number in attendance at the meeting which adopted the former resolution, was required.

PARLIAMENTARY INTELLIGENCE.

OPENING OF THE SESSION.

The Fourth Session of the First Parliament of the present King was opened by His Majesty on Tuesday last week, when, as is customary, he read the Speech from the Throne. The Chairman of Ways and Means (Right Hon. J. H. Whitley) reported that, in accordance with the Standing Order, he had conferred with the Chairman of Committees of the House of Lords (the Earl of Donoughmore) for the purpose of determining in which House of Parliament the respective Private Bills should be first considered. They had decided that the following Bills should originate in the House of Lords:—

Abertillery and District Water Board; Brentford Gas; Bristol Water; British Gas Light Company (Hull Station); Chelmsford Gas; Cleckheaton Urban District Council; Edenbridge Gas; Ellesmere Port and Whitby Urban District Council; Gas Light and Coke Company; Hightown Gas and Electricity; Leighton Buzzard Gas; Liverpool Gas Company; Llanfaelog Water; Longwood and Slaithwaite Gas; Manchester Corporation; Mexborough Urban District Council; Mexborough Water; Newport Corporation; Porthcawl Urban District Council; Reading Corporation; Rhymney and Aber Valleys Gas and Water; Skegness Gas; Skegness Urban District Council; South Bank and Normanby Gas Company; Stone Gas and Electricity; West Gloucestershire Water; Weston-super-Mare Urban District Council; Whitwell and District Gas.

All these Bills have been presented and read the first time.

The following Bills have been allocated to the House of Commons:—

Alliance and Dublin Gas Company Electric Supply; Ashington Urban District Council; Barnsley Corporation; Bedwas and Machen Urban District Council; Deal and Walmer Gas and Electricity; Haywards Heath Gas; Isle of Thanet Gas; Kidsgrove Gas; Leyland Gas and Electricity; London County Council (General Powers); Lurgan Gas and Electricity; Market Rasen Water; Middlesbrough Corporation; Northwich Urban District Council; Ossett Corporation; Preston Corporation; Riddings District Gas; St. Anne's-on-the-Sea Improvement; Sheffield Corporation; South Suburban Gas; Southend Gas; Tees Valley Water; Wadhurst and District Gas; Walsall Corporation; Worthing Corporation.

These Bills, with the exception of the Sheffield Corporation and the Worthing Corporation, have been presented and read the first time.

Non-Compliance with Standing Orders.

Certificates from the Examiners showed that the Standing Orders applicable to the following Bills had not been complied with—viz., Edenbridge and District Gas, Sheffield Corporation, Skegness Urban District Council.

Gas Provisional Order (No. 1) Bill.

This Bill was introduced by Mr. Robertson, supported by Mr. Burns, to confirm a Provisional Order made by the Board of Trade under the Gas and Water Works Facilities Act, 1870, relating to Bagnalstown gas. It was read for the first time, and referred to the Examiners of Petitions for Private Bills.

Municipal Trading.

Among the notices given for Private Members' Bills is one by Mr. Keir Hardie "to extend the powers of local authorities in matters of finance and municipal trading."

Petitions against Private Bills.

Petitions have been presented against the following Bills:—

Commons' Bills.

Alliance and Dublin Gas Company Electric Supply, by the Earl of Longford and Viscount de Vesci; Dublin Corporation; Kingston, Blackrock, and Dalkley Urban District Councils; Dublin Southern District Electricity Supply Company.
Ashington Urban District Council, by the Ashington Coal Company.
Barnsley Corporation, by the Urban District Council of Ardsley and others.
Bedwas and Machen Urban District Council, by the London and North Western Railway Company.
City of London (various Powers), by Edward Cecil More and others; Port of London Authority; Robert Horner; London Chamber of Commerce; Gas Light and Coke Company; Great Eastern Railway Company; London and South Western Railway Company; Metropolitan Water Board.
Deal and Walmer Gas and Electricity, by the Sandwich Corporation; South East Kent Electric Power Company; Deal Corporation; Walmer Urban District Council; Eastry Rural District Council; East Kent Light Railway Company.
Haywards Heath Gas, by the Keymer and Ditchling Gas Company; East Sussex County Council; Cuckfield Rural District Council; Haywards Heath Urban District Council; Balcombe Gas Company.
Isle of Thanet Gas, by the Margate Corporation; Broadstairs and St. Peters Urban District Council.
Kidsgrove Gas, by the Staffordshire County Council; Alsager Urban District Council; North Staffordshire Railway Company; Cheshire County Council.
Leyland Gas and Electricity, by the West Lancashire Rural District Council; Leyland Urban District Council.
London County Council (General Powers), by the Hammersmith Borough Council; Port of London Authority; Westminster City Council; Islington Borough Council; Corporation of City of

London; London Chamber of Commerce; Camberwell, Lewisham, Greenwich, and Wandsworth Borough Councils; Great Eastern Railway Company; Gas Light and Coke Company and others; London and North Western, and London and South Western Railway Companies; Kensington and Lambeth Borough Councils.

Lurgan Gas and Electricity, by the Armagh County Council; Lurgan Urban District Council; Down County Council.

Market Rasen Water, by Edmund Charles Tennyson d'Eyncourt; Thomas Hill.

Middlesbrough Corporation, by Lord Furness of Grantley; North Riding County Council; Middlesbrough Rural District Council; North Eastern Railway Company.

Northwich Urban District Council, by the Northwich Rural District Council; Middlewich Urban District Council; Cheshire Lines Committee; London and North Western Railway Company; Brunner, Mond, and Co.; W. H. Marsden and J. K. Marsden; Cheshire County Council.

Ossett Corporation, by the Wakefield Rural District Council; Batley Corporation; Great Northern Railway Company; Bradford Corporation.

Preston Corporation, by the London and North Western Railway Company; Lancashire and Yorkshire and London and North-Western Railway Companies.

Riddings District Gas, by the Derbyshire and Nottinghamshire County Councils; Great Northern Railway Company.

St. Anne's-on-the-Sea Improvement, by the Lytham Urban District Council; Preston Corporation; Lancashire and Yorkshire and London and North Western Railway Companies; John Talbot Clifton.

Sheffield Corporation, by the Chapel-en-le-Frith Rural District Council; Derbyshire County Council; Duke of Norfolk; West Riding County Council; Bakewell Rural District Council; Midland Railway Company; Derby Corporation; London and North Western Railway Company; Wortley Rural District Council; Yorkshire Electric Power Company; Leicester Corporation; Derwent Valley Water Board; Arthur Davey and Sons; Great Central Railway Company; Rotherham Corporation; Nottingham Corporation.

Southend Gas, by the Port of London Authority; George Thorne Wood and Bertha Louisa Alice Wood; Essex County Council; Southend-on-Sea Corporation.

South Suburban Gas, by the Commissioners of Sewers for Limits Extending from Lombard Wall to Gravesend Bridge; South Eastern and Chatham Railway Companies' Managing Committee; Erith Urban District Council; West Kent Electric Company; Croydon Corporation; Woolwich Borough Council; Alkali Manufacturers' Association.

Tees Valley Water, by Arthur John Dorman; Conservators of the Tees Fishery District; Owners, &c., of Lands, &c., on the Banks of the River Tees; Darlington Corporation.

Wadhurst and District Gas, by the East Sussex County Council; Herbert Taylor and William Walter Sixsmith; Heathfield and Waldron Gaslight and Coke Company.

Walsall Corporation, by the Staffordshire County Council; Midland Railway Company; Walsall Wood Colliery Company and William Harrison; Cannock Urban District Council; Walsall Rural District Council; Brownhills Urban District Council; London and North Western Railway Company; Birmingham Canal Company.

LEGAL INTELLIGENCE.

AN AGREEMENT FOR THE SALE OF A CONCESSION.

Mr. JUSTICE SARGANT, sitting in the Chancery Division of the High Court of Justice, last Thursday began the hearing of the action of the *Hong Kong and China Gas Company v. Glen*.

The Company asked for a declaration of invalidity of certain provisions contained in articles of agreement dated July 14, 1862, made between William Glen, Thomas Glen, and the Company, whereby the latter, whenever their paid-up capital should be increased above £20,000, were to allot one-fifth part of the increased capital to Thomas Glen, his executors and administrators, as fully paid. Alternatively, the Company claimed a declaration that, according to the true construction of the agreement, the provisions referred to ceased to operate after the paid-up capital amounted to £50,000. The Company were incorporated in June, 1862, with a nominal capital of £35,000, in shares of £10 each. Mr. William Glen had then the right of supplying the City of Victoria, Hong Kong, with gas. In consideration for this concession, the Company were to allot to Thomas Glen 400 shares of £10 each of the Company's capital (not exceeding £20,000), and pay his nominees £4000, which was to be used in paying for these shares. The Company were to apportion, fully paid, to Mr. Glen or his nominees, one-fifth of any increased capital, when the capital was increased. The Company issued 2000 shares of £10 each (1600 for cash, and 400 as fully paid) to Mr. Glen. In September, 1862, they issued a further 1500 shares—1200 for cash, and 300 to Mr. Glen; and in April, 1863, another 1500 shares—1200 for cash, and 300 to Mr. Glen. By a subsequent agreement plaintiffs claimed it was agreed that if the Company raised their capital to £70,000, as contemplated, they should issue 100 shares of £10 each to Mr. Glen, and he should accept this in full settlement of all claims he might have against them. Mr. Thomas Glen died in 1900; and Mrs. K. B. C. Glen and Mr. H. R. Glen were now cited as defendants, being his legal personal representatives. It was urged that a very important legal point affecting companies was raised by the action. The question was whether an agreement for the sale of a concession to a company for a certain number of shares in the company and an agreement to issue to the vendor a proportion of any increased capital was *ultra vires*. "Was it possible," it was asked on behalf of the plaintiffs, "for directors to create a debt against a company by entering into an agreement for the issue of shares except for cash?" The agreement set up only meant that up to the extent of a capital of £50,000—and the Company were under an obligation to the Government, who granted the concession, to raise £50,000 if necessary—they were to issue fully-paid shares in respect of one-fifth of the future capital to Mr. Thomas Glen or his successors. The Memorandum of Association authorized the Company to light the whole of the Empire of China with gas. It was contemplated that Mr. Glen would be getting concessions with reference to other towns in China; and there was an express condition that he was to offer them to the Company at a price to be agreed. The view of the defendants was that, not only were they entitled to a fair price for any future concessions, but they were also entitled to one-fifth of any capital which might be raised to pay the price of the concessions.

His Lordship remarked that the result would be that the Company would have to pay 20 per cent. more for any concession they took over from Mr. Glen than he was selling it for, or than any other company who took it over would pay.

For the defendants, it was contended that in the circumstances the agreement was a reasonable one. That it had turned out to be a good or bad bargain for the Company, was not the question to be considered. It had been entered into in good faith, and must stand.

Judgment was reserved.

DISCS FOR PENNIES IN PREPAYMENT METERS.

An Important Case at Manchester.

A case of considerable importance to gas undertakings generally, regarding the use of discs in prepayment meters in lieu of pennies, was heard last Tuesday at the Manchester Quarter Sessions, before the newly-appointed Recorder, Mr. ARTHUR JACOB ASHTON, K.C.

The defendant was Jane Roberts, a married woman, of Guy Street, Ardwick, and she was placed on trial on eight counts of the indictment, the first being "that she did, in incurring a certain debt, between the 10th of October, 1913, and the 22nd of January, 1914, unlawfully obtain credit of and from the Lord Mayor, Aldermen, and Citizens of Manchester, by means of fraud other than false pretences." In this case the amount was stated to be 1s. 8d.; the second, third, and fourth indictments being small sums of a total value of 1s. 8d. The remaining counts of the indictment against the woman were of obtaining this credit by means of fraud; these cases being under the Debtors' Act of 1869. The preliminary stages of the proceedings before the City Stipendiary were recorded in the "JOURNAL" for Feb. 3, p. 299. Defendant pleaded not guilty. A considerable amount of interest appeared to be manifested in the case, and several gentlemen connected with local gas undertakings were present when the case was called on at an early hour.

For the Manchester Corporation, there appeared Mr. WINGATE SAUL (instructed by Mr. A. F. L. Pickford, the Prosecuting Solicitor to the Corporation); the defence being entrusted to Mr. HANS HAMILTON (instructed by Mr. H. Darston Judson, of Manchester). Legal aid was granted to the defendant.

Mr. SAUL, in his opening statement, said that, although the indictment showed various counts, there was really only one offence, and charges such as these were often described in different ways in such an indictment. It was probably known to many of the Jury that the Manchester Corporation Gas Department were in the habit of supplying to the poorer class of consumer a large number of what were commonly called penny-in-the-slot gas-meters. Two classes of consumers were, he understood, supplied—one being what was termed the "ordinary" meter, for which 5s. deposit was paid; the other being for the houses of poor people who, perhaps, could not allow the 5s. to remain on deposit for any length of time, and therefore installed a prepayment, or slot, meter for which no deposit was required. In the case of the slot-meter consumer, no gas could be lawfully obtained unless a penny was placed in the slot of the meter; and, in return for the penny, the consumer was supplied with about 40 cubic feet of gas. After this quantity had been consumed, another penny was placed into the meter, and in this way the consumer obtained a renewal of the supply. It was obvious that, if one put anything into the slot which resembled a penny, a supply of gas would be obtained, just the same as if a penny were placed in the meter. Therefore, if the Corporation entrusted people like the defendant with slot meters, these people must, in return, act honestly to the Corporation. If they did not, there was a danger of the poor people being deprived of the privilege, and of the 5s. deposit being insisted upon by the authorities. He submitted that fraud was perpetrated if gas was procured other than by a penny; tokens or discs would not do. Defendant had one of these prepayment meters in her house; and on Oct. 10 last year, when one of the meter inspectors called, he found inside it a metal disc which was exactly of the size of a penny, and for which disc gas had been unlawfully obtained from the meter. The Inspector cautioned the woman and told her it must not happen again, and asked her to give him a penny in place of the disc. The defendant replied that she had not a penny, and could not give him one. The woman was certainly in poor circumstances; and, after again cautioning her, he told her that the practice must not be repeated. She replied that she would not do so again, and the man—a Corporation representative—put the disc back in the meter.

Following a short interruption in the proceedings, Counsel went on to say that he learned that the Manchester authorities supplied prepayment consumers with 37 cubic feet of gas for 1d. On Dec. 10 last an official from the Gas Department again visited the house to examine the meter. On this occasion he found two metal discs in the instrument. The woman was again asked for 2d., but replied that she had no money. On the inspector threatening to report the case, defendant promised to give him the 2d. next time. The official called again on Jan. 20, when he found that no fewer than 21 discs had been inserted in the meter. In other words, something like 800 cubic feet of gas had

been obtained by means of the alleged fraudulent discs; the value of the gas being estimated at 1s. 8d. Defendant was asked for an explanation of her conduct, and she made what the prosecution suggested was an untruthful reply: "I went to my sister's funeral yesterday, and the children must have been playing with the meter." To her statement with regard to the children the Inspector pointed out that her "explanation" was an impossible one, because many of the discs had been cut to the exact size of pennies to fit the meter-slot.

Proceeding, Counsel said the discs appeared to have been scissored from a toy engine of the kind usually purchased for children for about a penny; one of the discs showing what appeared to be a wheel of the engine flattened out. After the "wholesale" find of discs, the matter was reported to the gas authorities, and another inspector visited the house. He asked the defendant why she had been doing this sort of thing, and she replied that she had done it because she was short of money. This, of course, was no excuse for the fraud. When arrested, the defendant stated that she had intended to pay for the gas.

Counsel submitted that, although there were two sets of indictments, the real offence was that of obtaining credit by fraud. Gas was obtained without being paid for—it should have been paid for beforehand by means of pennies and not discs—and, in procuring gas in this way, fraud had been committed.

In reply to an inquiry,

Mr. SAUL said the present prosecution was the first of its kind. It had been instituted not with the idea of punishing the woman, but of putting a stop to the practice in order that other consumers might know, in future occurrences, that they would be proceeded against. Frauds of this kind ought not to be committed on the general community.

The RECORDER: Whose property were the real coins when they were placed in the box?

Mr. SAUL: The property of the Corporation, because they are put into the meter in payment for gas that is supplied by the Corporation. It is just the same as if the Corporation brought her a bag and said, "Here are 37 cubic feet of gas. If you give me a penny you shall have the gas."

The RECORDER: Supposing she gets more gas than there are pennies?

Mr. SAUL: I understand that is not possible.

Mr. HANS HAMILTON: I understand it is. I am instructed that, if the meter shows that more gas has been used than is represented by the payments, a bill is sent to the consumer for the balance.

Mr. SAUL: As we are not very clear on the matter, perhaps we had better take evidence on this point from a gas official on oath.

The RECORDER: Yes. It looks to me that she may have got plenty of additional gas, but that she did not get any additional credit; in fact, I do not see how she got any credit at all.

Mr. SAUL: What happened was that she got the gas without paying for it because discs are not pennies.

The RECORDER: But that is not credit. As I understand it, when the inspector opens the box and takes out the money, or the money and discs, he very properly says, "These discs are not payment, and you have got to pay for the balance of the gas." It seems to me that when the box was opened was the moment when the payment for whatever gas had been used should have been made. The inspector then says, "You have not paid in full. This money-box contains too little money."

Mr. SAUL: But this is a prepayment meter, and the consumer cannot obtain the gas until the penny is put in. The 37 cubic feet of gas are then taken from the meter, or passed through the meter to the consumer; and before you are entitled to a second 37 feet of gas, another penny has to be put in. Therefore the time of payment for the gas was before the consumer commenced to use it at all. I submit that credit runs from that point.

The RECORDER: It does not look like that to me. Did she obtain credit for herself? Did not the husband obtain credit?

Mr. SAUL: She did, because she put the discs in the box.

The RECORDER: If the husband paid the gas bill, I should have thought he was the person who obtained the credit.

Mr. SAUL: If she puts the discs in the box, as she admits, she gets credit for herself, because apparently it is her duty to put pennies in. If she puts discs in—that is the presumption—then I submit it is obtaining credit. It may be that her husband gave her pennies to put in—this is the hypothesis—and she puts in tin discs; then she obtains credit for herself.

The RECORDER: There is the Statute point. Is not the money-box a depositing-box, and when the inspector comes along and sees the meter dial he knows exactly what amount he is to receive?

Mr. SAUL: No. The penny was in prepayment for 37 cubic feet of gas. It is exactly like purchasing a penny article in a shop, because you first pay for the article and then it is handed over to you.

The RECORDER: A contractual right to credit?

Mr. SAUL: The offence would be, perhaps, more properly described if taken under an indictment for larceny.

The RECORDER: There you would have had considerable difficulty, but I am quite prepared to rule that if you like.

Mr. SAUL: As you please, Sir.

C. E. Capon, a Chief Inspector in the employ of the Corporation Gas Department, was the first and only witness called. In reply to Mr. SAUL, he stated that, in return for one penny, consumers were entitled to 37 cubic feet of gas. When the 37 feet were consumed the meter shut itself off. There is no possibility of any more gas going through the meter unless another penny is put in.

In reply to the RECORDER, witness said that, if a second penny was put in the box before the first 37 feet of gas have been consumed, the unused portion of the first 37 feet is added to the second supply. Half-a-dozen pennies could be put in the box at a time, and the consumer would then get six times 37 feet of gas.

In reply to Mr. SAUL, witness said the amount of gas consumed is recorded on the dial on the meter. If the dial registers less gas than there are pennies in the meter, the amount is returned to the tenant.

The RECORDER: On the other hand, if more gas has been consumed than is paid for——

Mr. SAUL: I understand that is not possible.

Witness: If the meter is working correctly, it is not possible to get more gas than 37 feet.

But they do get out of order sometimes?—Yes, but very few out of the hundreds of thousands in use.

The RECORDER said that, if the position was that the woman might have overpaid for the gas consumed, and, on the other hand, she might have underpaid for the gas, and that it was only when the inspector visited the house that he was able to ascertain what really had been consumed, he did not see how the woman had obtained credit by "fraud other than false pretences."

Mr. SAUL said the case was a very serious one to gas undertakings. It would be even more serious if, as a result of it, people got the impression that they could put other than legitimate coins in the box. These prepayment meters were of inestimable benefit to poor people who could not afford 5s. deposit for an ordinary meter. He emphasized the importance of the case both to gas undertakings and legitimate prepayment meter consumers. It rather looked as though the Corporation would have to take out all prepayment meters.

The RECORDER: I think this case is brought under the wrong Statute, but there are several ways you can prevent this kind of offence. The particular section of the Act does not seem to apply to this particular case. The prosecution has been perfectly brought, but the particular section of the Act is a difficult one. There are other sections under which the case might have been brought.

The RECORDER then directed the Jury to find the prisoner not guilty under the particular indictment, and she was discharged.

WORKMAN'S COMPENSATION CASE AT TOTTENHAM.

His Honour Judge Tindal Atkinson dealt with several interesting points in a reserved decision he has given in a case heard by him at the Edmonton County Court a few weeks since, in which the Tottenham and Edmonton Gas Company (now the Tottenham District Light, Heat, and Power Company) applied, under the Workmen's Compensation Act, to terminate an agreement, as from the 22nd of September last, by which a labourer named Albert Bushnell was paid 14s. 3d. a week as half wages in consequence of an accident sustained while in the Company's employ.

On Dec. 24, 1912, while the respondent was engaged in wheeling trucks at the Company's works, he sustained a fracture of the big toe of the right foot. It was asserted that he had recovered by Sept. 22 (since which date no compensation had been paid), and the applicants had offered him a job at mending sacks, with full wages. Respondent had refused this, on the ground that he would be unable to exercise his foot and give it the massage treatment that a medical man had advised him was necessary to complete recovery. It was stated by Dr. Scott and Dr. Bowie that the man had quite recovered, and was malingering. On the other hand, Dr. Tughan and Dr. Rostant said he required further treatment. It was also urged on behalf of respondent that the amount already paid as half wages was inadequate, as the Company had not properly calculated his average earnings. Moreover, it was contended that the Company were not entitled to deduct 6½d. per week in respect of insurance contributions, and that the respondent's bonus under the co-partnership scheme should be brought into account, in assessing the compensation.

In his judgment, his Honour decided that the incapacity of the respondent ceased on Sept. 22; but he held that the Company had not paid him the full amount to which he was entitled. Instead of his twelve months' earnings of £73 5s. 7d. being divided by 52 weeks, they should have been divided by 49 weeks. The average per week was, therefore, £1 9s. 11d. and not £1 8s. 6d.; and the respondent should have been paid 14s. 11¼d. per week. His Honour held that the deduction of 6½d. per week on account of insurance had no justifiation of any statutory enactment or otherwise. The respondent was also entitled to £1 17s. 0½d. in respect of the co-partnership bonus, which must be taken into consideration in arriving at his remuneration. While determining the agreement, his Honour made an order that the Company was liable to the respondent in the sum of £4 4s. 6½d.

"Mechanical Ingenuity" Misapplied on a Gas-Meter—A Magistrate's Inappropriate Remarks.

In the Children's Court at Old Street, E.C., last Friday, Mr. Chester Jones was told how a boy ten years old disconnected the supply and service pipes of a prepayment gas-meter, and turning it upside down, managed to abstract at various times the sum of 2s. 7d. in coppers, the property of the Gas Light and Coke Company. The meter was in his mother's house in Columbia Road, Bethnal Green. In answer to the Magistrate, the boy said no one had told him to do it; it just came into his head while he was cleaning his father's tools. It was stated in Court that a powerful wrench or spanner would be required to unscrew the nuts holding the pipes. Prisoner's mother said the boy had a fondness for mechanics, and was always "tinkering about" with tools. Mr. Chester Jones remarked that the boy evidently had an ingenious and mechanical turn of mind; but his ingenuity was applied in a wrong direction. It would be an awkward thing for the Gas Company to have it known that pence could be abstracted from their meters by turning them upside down. But, personally, he considered that automatic gas-meters were responsible for making most of the youthful criminals in the East End of London. The boy was remanded for a week. Asked whether he wished to see a representative of the Gas Company then, the Magistrate said he did not, unless they were prepared to come forward with a proposition to keep and educate the boy as some recompense for having led him into temptation.

The Nottingham Lighting Committee have agreed that the whole of the lamplighters of the city shall have one day's rest in seven; the men on their part pledging themselves not to ask for an increase in wages during the next three years.

MISCELLANEOUS NEWS.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of the Proprietors of this Company was held on Wednesday last at De Keyser's Royal Hotel, Blackfriars—Mr. CHARLES CARPENTER, D.Sc., M.Inst.C.E., in the chair.

The SECRETARY (Mr F. M'Leod) read the notice convening the meeting, and the minutes of the last ordinary general meeting.

The seal of the Company having been affixed to the "Register of Proprietors,"

The CHAIRMAN said: Ladies and Gentlemen,—You would have to go back a long way in the history of this Company in order to find an occasion upon which your Directors had presented you with a statement of accounts showing an adverse balance in any way comparable with the deficiency to be met as the result of the past half-year's working. As a matter of fact, your backward search would be continued for twenty-four years before you would find such an occasion—viz., in 1890. I need not remind you that in that year you had to pay the bill for the strike of gas stokers which had occurred just prior to Christmas, and which threatened the Company's very existence. But you loyally paid it—making sacrifices by way of dividend as the consumers did in comfort; and as soon as the crisis was passed, the Company continued its policy of working with as narrow a margin of profit as was possible and consistent with its obligations.

THE COAL STRIKE OF 1912.

Two years ago the coal-producing industry passed through a similar crisis, but with a different result as regards after-effects. A feverish, though natural, rush to replenish stocks manifested itself, to a certain extent in England, but mainly upon the Continent, the nations of which must have British coal for their manufactures. For this coal of ours, they were able and willing to pay any figure asked: and up went the price, with the effect that so far from being out of pocket by the coal strike the coal producers have as a result of it made very large profits indeed. Those who have suffered most by the disturbance have been those who, like gas undertakings, have public services to perform, and who for the past two years have been paying an extravagant price for their raw material. I may be told that all this is the result of the law of supply and demand. Very likely it is; but it certainly seems a faulty law when compared with that under which a gas company works. I need not remind the shareholders here to-day that, before they can take a penny extra in the way of dividend, the price of gas has to be reduced; and if it is necessary for gas consumers to have such a restriction as this placed upon the suppliers of gas, is it any less necessary to give some protection to the consumers of coal also? The price asked for the raw material necessary to meet the requirements of London is largely governed by the figure the capitals and important cities of Europe are willing to pay—from Stockholm and Copenhagen to Paris and the Mediterranean. Now that money is wanted to build Dreadnoughts, interest might well be revived in an export duty upon coal, which is in a sense your birthright and mine, as indeed of every other inhabitant of these islands. It is for protection against the foreign nations that heavy expenditure on battleships has to be incurred; and they might in fairness be required to pay in this way something towards the cost.

RESTRICTIONS ON EXPORTS OF COAL.

There would be a collateral advantage in any restrictions placed upon the export of coking coal. This is not only required for gas-making but for the production of the metallurgical coke necessary in the manufacture of steel. An export duty, while leaving coke untouched, would encourage its manufacture in Great Britain, giving her the advantage not only of using the gas, but, not less important, the motor oils and spirit which are becoming daily more and more necessary to us. The Continent now buys this coking coal, converts it into the coke necessary for the steel furnaces, and uses the gas (which is a bye-product) for lighting towns, and the motor oil and spirit for running their heavy engines, such as Diesel oil engines and the lighter engines in motor-cars. The process is essentially one which should be encouraged in England; and an export tax upon coal would do this, and at the same time extend our industries and increase employment at home.

THE FUTURE OF THE COAL MARKET.

You may probably ask and expect me—I having told you what you know from the balance-sheet, that we have a heavy deficiency to meet—to tell you what are the signs of a more favourable market for coal. Fortunately these are promising. We understand that the City of Paris contracted for its requirements early last month at a substantial reduction compared with a year ago; and later still several of the North European cities have paid half-a-crown per ton less for forward contracts. Were it not for the substantial reduction of which these sales are the foreshadowings, we should have no other course left than one your Board has several times discussed—namely, to raise the price of gas. But it would be unfair to the consumers of gas in South London that they should be asked to submit to this hardship. There is no economic reason for it, since coal can be produced and put upon the market—after paying a good profit to the owners and full and liberal wages to the workers in that industry—at a considerably lower figure than we are now paying. On the question of the export of coal being so serious as I have endeavoured to make out, it would appear from a note in the "Colliery Guardian" of the 6th inst. (when dealing with the question of export) that: "It is growing so rapidly that it was recently stated that 'all developments seem likely to do little more than keep up with the increase in exports.'"

RESIDUALS.

The other serious matter in connection with our business is the fact that the value of residuals has fallen considerably. For instance, as regards ammonia, which is one of the large factors in the balance-sheet, the price has fallen considerably. The enormously increased production is no doubt responsible for this; and, although the world's requirements seem to be limitless, no doubt a great deal is to be done in the way of educating people all over the world as to the importance of scientific manuring. In this education, we are taking our part through the medium of the Associated Producers of Sulphate of Ammonia, who do a great deal to encourage the use of ammonia all over the world. Then, coke is another of our important bye-products the value of which has fallen considerably; and, in this connection, I might give you an example of another method of handling the sale of fuel in the relationship which existed for many years between ourselves and the cement industry. They depended upon gas coke for their furnaces, and we made our yearly contracts with them, not at the market price of coke, but at such a figure as, having regard to the state of their trade, they were in a position to pay. In other words, we recognized the mutuality of interest, and endeavoured to bring both into the equation. The arrangement worked well for a great many years, though to-day we are having to seek other markets, consequent upon the adoption by the cement makers of another type of furnace which consumes coal instead of coke. The other serious matter as regards residuals is the price realized by ammonia, which has fallen considerably. There is no doubt that the enormously increasing production is responsible for this; and though the world's requirements are probably almost limitless, much has still to be done to educate its inhabitants in the importance of scientific manuring. We are taking our part in this important work, the fruits of which cannot but be valuable.

GAS SUPPLY RAPIDLY ADVANCING.

If the cost of raw material and the prices realized for bye-products cause us anxiety, there is none about our main business—that of gas supply. The increase may seem a small one, but it is upon a large one during the corresponding period a year previous. We are undoubtedly reaping the benefit of the fostering care we have given to the lighting portion of the gas demand, which, though seasonal, is constant—depending upon the duration of darkness, rather than those fickle changes of temperature to which we are so accustomed, and which are certainly not so profitable to the supplier of gas as the shortening days. Gas lighting has been enormously discredited in the past, entirely by the inadequacy and unsuitability of the appliances required for using it. We were laughed at when we first went into the market for artistic gas-fittings. "Who wants them?" we were asked. Mainly upon our initiative, an enormous business in them has now sprung up, the benefit of which is being felt by other companies as well as by ourselves. But the greatest advance has been by the so-called "Metro" burner—an inverted incandescent burner which I had the pleasure of describing to you at a former meeting. We have now more than 100,000 of them in use; their rate of adoption being really governed by our ability to keep going with the supply. We have said good-bye to the day when our interest in our consumers finished with giving them a supply of gas at the outlet of their meters. For a long time we have been handicapped by the fact that suppliers of gas-burning appliances produced them by rule-of-thumb, as they had been in the habit of doing during the last century, while the rival energy had the advantage of scientific brains, aided by the latest mechanical and physical equipment, to produce for the market the appliances current to-day. We ourselves have for some time past been doing the same for gas. We are continually at work in our laboratories, seeking for the best devices to satisfy the consumers' needs, and then, with the manufacturing aids of an open market, ensuring that the appliances are available for everyday life and use. These productions of ours have won praise and approval from the heads of gas undertakings all over the kingdom; and they have even been echoed from the Continent. Our exhibit at the Ideal Home Exhibition at Olympia last year was a revelation to many as to the possibilities of gas for, above all, pleasing and artistic lighting.

GAS PURIFICATION.

It has been our supreme faith in the lighting side of our business that has inspired the thought, time, and money we have devoted to the purification of gas. If gas were only to be used for heating and cooking, the products of combustion would go up the chimneys, and the sulphur content would matter little. But it is different when gas is burned in our living rooms. Wherever you have life, you have products of combustion. The problem we set ourselves was to put those from gas lighting on a par with those which result from our own bodies as the consequence of the food we eat, *plus* the enormous gain in ventilating and purifying the atmosphere which flame has been known, from time immemorial, to bring about. The report tells you how we have succeeded in achieving this result. It has been stated by an independent authority that the invention will prove as great a one for gas lighting as was that of the incandescent mantle by Von Welsbach. But if it does not deserve to be appraised so highly, it can at least be claimed that by it the work of Welsbach is completed, since the soft pure brilliancy of the wax candle is obtained through the convenience of a gas supply without any foundation remaining for the suggestion that the products of combustion are any more harmful to ourselves or our belongings. I ought perhaps to add that the amount of metallic nickel necessary for working the process is not large. We thought it wise, however, to cover our requirements in this respect before publishing the results of our experiments; and we have, therefore, stocked sufficient to last us for some years to come.

ACCIDENT FUND.

We have again the pleasure to report that our mutual accident fund (prevention and payment, it might be called) has been for the fourth time certified for five years. Many of you may not know that among its provisions is one for inquiry into every industrial accident by a jury of workmen. We and our employees have been enormous gainers by it. When we commenced sixteen years ago, our accidents were equal to 8·16 per cent. of men employed. Last year they were the lowest on record—namely, 3·43 per cent. The fund is managed by a Joint Committee of officials and workers; and as they constitute what is practically a "Court of Summary Jurisdiction," justice is quickly, fairly, and, I may add, cheaply given. I cannot forbear to contrast the working of this fund with the National Health Insurance; for the longer experience we have with it, the more we must regret that the Government

could not see its way to comply with our workmen's earnest request, and put them in the same position as those of a borough council, by allowing them to contract-out of its provisions, to the same mutually advantageous end as in the case of the accident fund. With the latter, a few simple rules which a workman can almost memorize suffice for its administration. Formalities are few; disputes unknown; administration is at once simple and effective. But with the health fund simplicity has given way to the ponderous, complex, and costly machinery run by the Insurance Commissioners, and under which, whether he likes it or not, the working man is compelled to enter into a contract, the terms of which are as complicative and voluminous as can well be imagined. The advantages of a health society worked with full regard to the particular requirements of its members, has been swept away; and its administration is now regulated to suit the decrees of a government department whose chief concern seems to fetter them as much as possible in the toils of its own red-tape. What we should have done had we not in its Secretary an able member of the Bar (and I am pleased to have this opportunity of paying well-deserved tribute to Mr. Lesser) I am sure I do not know.

CO-PARTNERSHIP.

It is more pleasant to turn to our co-partnership, which continues to justify all that has been claimed for it. During the recent coal porters' strike, for instance, although extraordinary demands for coke were made upon our staff and workpeople—necessitating their working late and early (in some cases all night)—the service was freely given and enabled us to meet the public demand with a promptitude which, without a largely augmented staff, would be impossible of achievement in a non-partnership undertaking. I may say that in one day we sent out 26,000 paper bags containing 28 lbs. of coke.

I have now drawn attention to the salient features of the report. The remaining paragraph refers to the re-election of Directors; and separate resolutions will be submitted dealing with them. I now have the pleasure to move:

> That the report and accounts now presented be received and adopted, and the report entered on the minutes.

The DEPUTY-CHAIRMAN (Mr. John Mews): I have much pleasure in seconding the motion.

The CHAIRMAN: Before I put the resolution formally to the meeting, I shall be glad to hear any remarks the shareholders desire to make.

There being no remarks, the resolution was put and carried unanimously.

THE DIVIDEND.

The CHAIRMAN: I now beg to move

> That a dividend at the rate of £5 9s. 4d. per cent. per annum be now declared, and that the warrants be transmitted to the registered addresses of the proprietors by post.

Mr. JAMES WATERER seconded the motion; and it was carried unanimously.

RE-ELECTION OF THE CHAIRMAN.

The DEPUTY-CHAIRMAN; The next motion on the *agenda* is the re-election of the Chairman. It is a privilege which I have, and it is a very great honour to me, to suggest his name to you. You probably all know him by sight, and many of you know him by reputation. The business he has to conduct is a very anxious one at the present time. It is also a very progressive one; and, in consequence of this, we want to have the best man we can get to take the chair. I consider Mr. Carpenter the best man to take the chair for two reasons. First of all, he has a great knowledge of the making of gas; and in the making of gas you must not keep to old principles and rules which may have guided people fifty years ago, but you must have considerable research power of your own, and you must also employ people always engaged in research work. In this Company we do a great deal of that work. Mr. Carpenter is the head of that department. Therefore, I feel that, so far as the manufacture of gas is concerned, you have the right man. But there is another point. You may make gas, but you may not be able to sell it. The competition now-a-days on all sides makes it more difficult to sell gas than it was before the other illuminant came into vogue. With regard to this, Mr. Carpenter has a very commercial mind, and he is able to grasp exactly what is the proper thing to do. He goes for it straightly and honestly, but he does not attempt to delude anybody; and in this respect I think he is as good a man as you can get.

Mr. JOHN EWART: I have very great pleasure in seconding the motion. I endorse every word Mr. Mews has used. You all know Mr. Carpenter's qualifications better than his colleagues do.

The resolution was put, and carried unanimously.

Mr. JOHN MEWS: Allow me to congratulate you, Sir, and the shareholders, upon your re-election.

THE CHAIRMAN'S REPLY.

The CHAIRMAN: I tender you my sincere thanks for your re-election of me to a position on the Board of the Company; and I very highly appreciate the honour you have conferred upon me in so doing. I can only say that I will endeavour in the future, as I have endeavoured in the past, to do my duty. I may say that I should not be able to occupy a position of this kind—which I need not tell you is one of very great anxiety—but for the thoroughly loyal manner in which our officers and staff support me.

RE-ELECTION OF DIRECTOR AND AUDITOR.

The CHAIRMAN: Now, allow me to propose—"That Mr. Laurence W. S. Rostron be re-elected a Director of this Company." Mr. Rostron has followed in the footsteps of his father, who, many of the old shareholders will remember, was for many years a Director of the Company. The hopes we formed of Mr. Rostron's usefulness have been realized during the period he has sat with us at this table. He is an intelligent, hard-working, and industrious colleague; and, as such, I beg to move his re-election.

Mr. JOHN MEWS seconded; and the motion was carried unanimously.

Mr. ROSTRON said he most sincerely thanked the meeting for the honour they had done him in re-electing him a Director. He regarded it as a great privilege and a great honour; and he thanked them for this renewal of their confidence.

Mr. T. H. NIXON said he had much pleasure in moving—"That Mr. Charles Pelham Crookenden be re-appointed an Auditor of the Company."

Mr. RICHARDS seconded the motion, and said the name of Crookenden had been associated with gas and water for so many years that he was sure they could not do better than re-appoint Mr. Crookenden as their Audior.

The motion was put, and carried unanimously.

VOTES AND THANKS.

Mr. EDGAR said it would ill-befit the meeting were they to leave without passing a vote of thanks to the Chairman for taking the chair, and to the Directors for helping him in the very tiresome task of bringing to a successful issue a trying half year. He desired also to make a sympathetic allusion to the passing away of Mr. George Howlett. His voice had been frequently heard in the room; and his ideas upon gas matters were always listened to with a great amount of respect. A casual reference to the accounts disclosed that everyone concerned had had to work very hard to bring about a success—for a success it had undoubtedly been, taking into consideration the fact of the abnormally high prices of coal, that their district had not been extended, and the mildness of the weather experienced. He must congratulate the Directors that, even with all these disadvantages, they had been able to maintain their own, and bring about a substantial profit. He moved a hearty vote of thanks to the Chairman and the Directors.

This was seconded, and carried unanimously.

THE OFFICERS AND STAFF.

The CHAIRMAN: I can assure you that both myself and my colleagues are very much indebted to you for the vote of thanks which you have so heartily passed. The proposer has truly said that the period under review has been one of great anxiety to your Board; but, despite this, we have been able, I think, to show you that our business is on a perfectly sound and progressive basis, though we are, as I have endeavoured to point out, unfairly handicapped by the price of the raw material. We could not have made the success we have, and we could not look forward to a continuation of this success, without we knew that we had an admirable staff to carry on the thousand and one duties pertaining to the manufacture and the selling of our gas, and getting in touch with the consumers so that they get the full benefit from it. We have a first-rate staff to deal with all these matters. Therefore I hope you will allow me to propose a hearty vote of thanks to the officers and staff of the Company for the attention, the care, and the energy they have shown in the conduct of the Company's business during the last six months. In this matter it is, of course, impossible to individualize; but I may say that our business is, roughly, divided into two departments—the technical and the commercial. The strings of the one lead into the Secretary's office, and the strings of the other lead into the Engineer's office.

The CHIEF ENGINEER (Mr. W. Doig Gibb) said it was indeed kind of the Chairman to have expressed his satisfaction with the way the staff had done their duty. He did not at all mind confessing that they had had a very strenuous six months; but the technical staff had responded most loyally. Unfortunately, it was not for them to control the price of coal; but he was glad to say that the record for the past six months from the works had beaten all earlier records for economical working, which proved that, from the point of view of the technical staff, the greater the troubles and obstacles they came across, the more strenuous they were in their desire and perseverance to get the better of them.

The SECRETARY (Mr. F. M'Leod) said he could, like Mr. Gibb, speak of the loyalty shown by every member of the commercial staff; and also, like Mr. Gibb, he was proud of their record for the past six months. He was sure that everyone would feel encouraged by the kind words spoken by the Chairman and endorsed by the meeting. In the names of one and all, he thanked the meeting for their vote of thanks.

SOUTH SUBURBAN GAS COMPANY.

The Ordinary Half-Yearly Meeting of the Company was held last Friday at De Keyser's Royal Hotel, Victoria Embankment, E.C.—Mr. CHARLES HUNT, M.Inst.C.E., in the chair.

The SECRETARY (Mr. Wilfrid Wastell) read the notice convening the meeting; and the report and accounts were taken as read.

THE COAL BILL AND RESIDUALS RECEIPTS.

The CHAIRMAN, in moving the adoption of the report and accounts, said: The accounts show an unwelcome, although not a wholly unexpected, break in the good fortune which has attended the operations of the Company for a considerable period. For the first time for a good many years, the profit actually earned during the half year is insufficient for the payment of the full statutory dividends; and the deficiency, amounting to £7146, will have to be taken from the balance of profits previously earned, and carried forward from half year to half year. Withdrawals from this balance cannot but occur now and then, for the very simple reason that abnormally heavy manufacturing charges, such as that of the existing price of coal, cannot with impunity be passed on to gas consumers, so that increase of price has come to be regarded—and rightly so—as the very last resource. In addition to an exceptionally heavy coal bill, amounting to over £10,000, or 2s. 4d. per ton, more than that for the corresponding period of the previous year, the revenue account shows a serious shrinkage in the receipts for residuals; coke and sulphate of ammonia having realized less by 3s. 1d. and £1 1s. 4d. per ton respectively. Tar alone has maintained its previous value. Coke enjoyed a transient gleam of prosperity during the recent coal porters' strike, which it is hoped

has opened the eyes of many of the public to its advantages; while a good deal may also be expected from the labours of a Committee representative of various gas undertakings, which was recently formed for the purpose of drawing general attention to the superiority of coke over coal—when consumed under suitable conditions—for many industrial purposes, as well as for domestic use. There is a good deal of misconception on this subject; and the present depression will have served a very useful purpose if it should result in a better understanding on the subject. Coal is now costing no less than 5s. 7d. per ton more than it was about two years ago. To find a parallel it is necessary to go back as far as the year 1900, when prices were about 1s. per ton more than at present; but gas was then 2s. 10d. per 1000 cubic feet, or 7d. more than the present price in the old South Suburban area. Our coal bill to-day is, in fact, over £41,000 per annum, or nearly 5d. per 1000 cubic feet of gas sold more than it would have been at the prices of two years ago, and nearly £22,000, or 2¼d. per 1000 cubic feet sold, more than if calculated at the next highest price paid during the last ten or twelve years prior to 1912, which was the year of the national coal strike. For a too brief period, however, better returns from residuals did make up in some measure for the higher prices paid for coal. But these better returns have vanished, and, instead, the receipts for the half year under review amounted in the aggregate to about ⅜d. per 1000 cubic feet sold less than they did when coal was costing less by nearly 5d. per 1000 cubic feet sold. Putting these two figures together, it is seen that, taking coal and residuals alone, the cost of gas making has increased by about 5¼d. per 1000 cubic feet sold—a very heavy burden, the like of which on every former occasion has been relieved by a somewhat corresponding advance in the price of gas. This time, however, no such compensating advance has been made. On the contrary, the price of gas is lower than it was two years ago, and now stands at the lowest point ever reached in the history of the Company. It will, therefore, be realized that the present position is one that could not be very well sustained for any considerable length of time.

COAL PROSPECTS, AND A GOOD MANUFACTURING POSITION.

It is not likely that the next statement of accounts will make any better showing, since no improvement is to be anticipated in residuals, and there are the high-priced contracts for coal to be worked off. But we think we see a silver lining to the cloud, in the shape of a growing probability of cheaper coal. For some time past the general trade of the country has shown signs of shrinkage; and this has greatly lessened the demand for fuel, as has been only too apparent in regard to coke. Gas coal cannot but share in the downward trend of prices; and, as a matter of fact, last year's prices are not now being maintained. What the measure of relief will be, it is impossible to say; but upon this must depend the possibility or otherwise of dispensing with an increase in the price of gas. In the meantime, it is a real pleasure to be able to say that the manufacturing results continue to bear favourable comparison with those of any other works similarly situated, and also that the goodwill and hearty co-operation of the Company's employees not only continue unabated, but are manifested to an increasing degree, if this were possible. It is, indeed, highly gratifying to know that in these exceptional circumstances the spirit of co-partnership is by no means found wanting.

THE GAS BUSINESS.

As regards increase of business, the prospects continue to be encouraging; and in the added areas especially, considerable progress has been made. The figures given in the report will supply an idea of the development which is taking place; and, with your permission, I will supplement them with others relating to the whole of the year 1913, which may for this purpose be regarded as the first complete year of active operations following upon the amalgamations. During that year there were added no fewer than 5283 new consumers, or 9·05 per cent.; 6683 cookers, or 18·8 per cent.; and 3298 fires, &c., or 35 per cent.—of the previous totals respectively. To what extent these figures will be repeated remains to be seen; but they bear testimony, so far, to the energetic and zealous service rendered by the Company's staff in this department, as one result of which, it may be mentioned that already the gas consumption in the old West Kent area is nearly double what it was at the time of the amalgamation. Very satisfactory progress has also been made in the Bromley and Crays area; and but for the exceptionally fine weather which prevailed throughout the greater part of the half year, there is no doubt whatever that the total increase in gas consumption would have considerably exceeded the modest 2·04 per cent. which is recorded. It may be a melancholy, but it is none the less an undoubted, fact that gas undertakers benefit in the shape of extra gas sales by reduction of temperature and bad weather generally, just as they also benefit by times of bad trade in the shape of cheaper coal. Nevertheless, they are, I am sure, public-spirited enough to wish permanence both to good weather and to good trade; such wish being perhaps none the less fervent because experience has convinced them of the inextinguishable vitality of gas.

DOMESTIC HEATING.

Thanks in a great measure to the considerable improvements effected during recent years, gas-fires have become an ever-growing feature of the business. Every year these are being fixed in larger numbers—a convincing proof of their increasing popularity; and it is doubtful if more than what may be called the fringe of the possible business in them has yet been touched. During the mid-winter spell of cold weather, it was not possible to cope with the demand for them; and consumers who contemplate their use would do well to avoid risk of disappointment by availing themselves of the advantage offered by the Company of free fixing, without charge for hire, during the summer months. This system has been introduced with the twofold object of securing to the consumer better attention to his requirements than can always be given when business is congested, and of ensuring to the workmen greater regularity of employment. Last summer a good many consumers availed themselves of these terms; and it is much to be hoped that their example will be followed in increasing numbers. As showing the effect of these fires, and at the same time of temperature, upon gas consumption, it may be mentioned that during the cold weather already referred to, the daily gas output showed increases varying from about 8 to 17 per cent. as compared with the corresponding days of the previous year.

HIGH-PRESSURE GAS AND SHOW-ROOMS.

Several installations of high-pressure lighting have recently been supplied in some of the principal shopping districts, and are giving great satisfaction. The efficiency and economy of this class of lighting is, in fact, beyond question, and is rapidly gaining for it extended use. Advantage has been taken of the need for increased office accommodation at Lower Sydenham to enlarge and modernize the show-room there; and the show-room and offices at Bromley are being to a considerable extent rebuilt, with the object of providing a show-room and other accommodation adequate to the growing requirements of that important business centre.

CAPITAL EXPENDITURE.

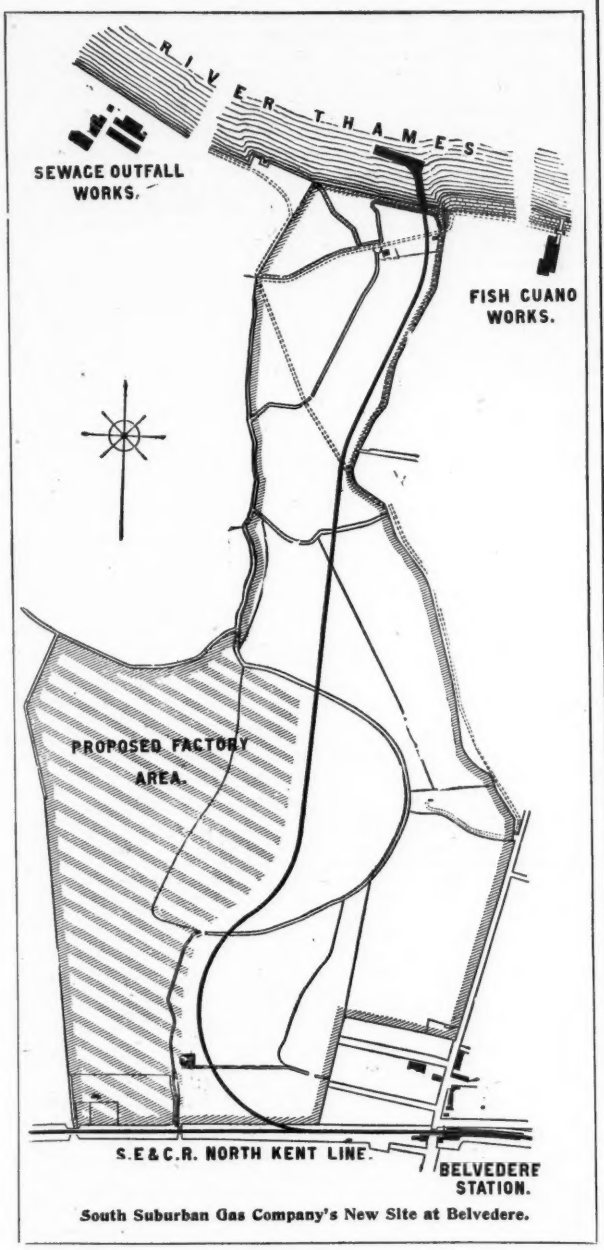
It will be readily understood, even without reference to the capital account (which tells its own story), that the important expansion of the business which is now going on cannot be effected without considerable expenditure. It is, indeed, a more costly business to increase the number of one's customers now than was formerly the case, because whereas in the olden time all that had to be provided after mains were laid were the service-pipe and meter, now there is generally a cooker, and often two or three fires, or some other heating appliance, in addition; while with the penny-in-the-slot meter, fittings and burners have to be provided. The expenditure incurred in these and other directions may shortly make it necessary to issue a further amount of stock—probably debenture—of which due notice will be given.

TWO NOTABLE EVENTS.

There are two somewhat notable events of the period under review which I should like to mention, as being closely connected with the welfare of the gas industry. These are the great gas exhibition at the White City, which was held last autumn under the auspices of the Institution of Gas Engineers, and the more modest, though none the less admirable and comprehensive, exhibit by the South Metropolitan Company at the Ideal Home Exhibition, which was held about the same time—though for a shorter period. The White City Exhibition was in point of magnitude far in advance of any of its predecessors; and its organizers earned the thanks of all concerned for having made a very effective display, which could not but strike the imagination, and convey a lasting impression of the utility and importance of the gas industry.

COMPANY'S BILL IN PARLIAMENT—THE ERITH SITE.

With your permission, I will now say a few words on the subject of our Bill before Parliament, and which will come up for consideration at the close of this meeting. It will be remembered that the manufacturing works of the late West Kent Company are situated on the river at Erith, and occupy a small portion of an area of land about 7 acres in extent. Upon this limited site it was not possible to contemplate the erection, either now or hereafter, of works of sufficient size to secure the full advantage of riverside accommodation; while the want of railway communication would have very seriously hampered the disposal of any considerable quantity of coke. Under these circumstances, the Directors felt it would be unwise to continue the reconstruction of the works that had been commenced by the late Company, or to incur any expenditure that would involve permanent occupation of the site, especially as, after very careful inquiry, it was found that additional land in the immediate neighbourhood was not available except at prices which placed it beyond reach, and under restrictions which it would be difficult to set aside. The site which, after prolonged inquiry, has now been secured for the future operations of the Company if and whenever additional carbonizing plant is required can, I think, be described as almost—if not quite—the only one of fairly reasonable extent within the Company's area of supply possessing the three essentials, rail, river, and road frontages, and at the same time obtainable within the slender means of an impecunious gas company. [Laughter.] It is shown by a cartoon on the wall [see accompanying drawing], on which an endeavour has been made to indicate some of its surroundings. Situated almost within a stone's throw of the Belvedere Station of the North Kent line of the South-Eastern and Chatham Railway, and having on the one side as a near neighbour an artificial guano works, and on the other as a somewhat more distant one the Southern Outfall Sewage Works, it is what some would describe as an ideal spot for a gas-works. It comprises six different small holdings, all of which have had to be secured, and which make up the total of 189 acres. This is, of course, much more than is likely to be needed for gas-works purposes for many years to come; but practically the whole of it is in occupation at rents which, together with the value, when realized, of the Erith site, will in the meantime reduce the annual charge upon the undertaking to a very moderate amount. How soon this land may be required depends upon the increase of business, which, for the next two or three years at any rate, will probably be covered by the Bromley works; these having been brought into operation to only a small extent this winter. But whether soon or late, here is a provision for the future, the cost of which is exceedingly small in comparison with the advantage that may hereafter be derived from it. The various provisions of the Bill will be explained by Dr. Blyth, but mention may be made of some of them. In the first place, we are seeking to secure a little more elasticity in regard to the number of Directors to constitute the Board. Quite recently, it became necessary to obtain parliamentary sanction to a temporary reduction of the number; and the same course might have to be adopted if for any reason it was felt advisable, as may possibly happen, to temporarily increase it. It is therefore proposed that the number be not more than eight nor less than five. It is also proposed to get rid of what is known as the chemical clause, which, at the instance of the Alkali Manufacturers' Association, was imposed on the Company and others two years ago; its object being to prevent one gas undertaking purchasing residuals from another gas undertaking to work up with their own. To this restriction we offered the strongest opposition, which, although ineffectual as to direct result, was nevertheless mainly instrumental in convincing the Parliamentary Authorities of the necessity for further inquiry. This was subsequently held by a Joint Committee of both Houses; the result being a complete vindication of the opposition



South Suburban Gas Company's New Site at Belvedere.

offered to the imposition of the clause. What is now being asked for is practically a restoration of the *status quo ante*. There is just one other provision which may be mentioned—namely, the power to supply electricity within the area. On a part of the land which is not likely to be needed for gas-works purposes, and which is indicated on the cartoon as "Proposed Factory Area," it is proposed to invite the erection of factories, for which a cheap supply of electricity for power purposes is an absolute necessity; and we think we see a double advantage in furnishing this supply in conjunction with our own gas-works requirements, inasmuch as the cost of combined generation should be somewhat less than if each supply were to be separately generated. It cannot be too clearly understood that the object of the proposal is to add to the attractiveness of this surplus land, the proposed development of which is in the best interests of all concerned.

Mr. CHARLES CARPENTER, D.Sc., seconded the motion.

Alderman PORTER remarked that the Chairman had laid great stress on the price of coal. Did not the Directors make a bad contract? He had a number of other reports from other gas companies, the boards of which did not seem to be in the same terrible predicament that their own Board appeared to be in. As to the increase in the consumption of gas in the outer area, how did they stand with regard to the South Suburban district? Had they exhausted this area? because 2 per cent. was not a large amount. They were also crying out about coke. But were they crying out, too, about tar? This residual was going wonderfully well in the case of some of the companies.

The CHAIRMAN replied that the Board made the best contract for coal they could do. As to the increase in the consumption of gas, he might remind Alderman Porter that the Gas Light and Coke Company had an actual decrease in their large area, and the Commercial Gas Company had only $\frac{1}{10}$ per cent. increase. Therefore their own Company were not so badly off with a 2 per cent. increase. The South Suburban area had not developed to any extent—in fact, it was already pretty nearly saturated. As he thought he explained at the time the Amalgamation Bill was introduced, they were glad to have such a field for their energies as the West Kent area, which they were now developing to their own advantage and that of the gas consumers.

The motion was unanimously carried.

The CHAIRMAN moved, and Mr. G. ROSS seconded, the declaration of a dividend for the half year at the following rates per annum: 5 per cent. on the preference stock, 6 per cent. on the ordinary stock, and $5\frac{1}{2}$ per cent. on the West Kent ordinary stock, all less income-tax.

The motion was agreed to.

The CHAIRMAN proposed that Sir J. Fortescue Flannery, Bart., M.P., and Mr. John Boraston be re-elected Directors. He remarked that it would be almost impertinent on his part to enumerate the claims of these gentlemen to a renewal of the proprietors' confidence. He might, however, just say that their parliamentary connections rendered them additionally valuable to the Company. Sir Fortescue had recently accepted the honourable office of President of the Gas Companies' Protection Association; and he might be relied upon in this capacity to further the interests of the gas industry in the House of Commons. Mr. Boraston might be congratulated upon having lately carried out an amalgamation of interests exceeding in importance any gas amalgamation, if that were possible; and of which he was now the controlling head. They wished him hearty success in his enlarged sphere of activity.

Mr. ALEXANDER DICKSON seconded the motion; and it was unanimously carried.

On the proposition of Mr. B. R. GREEN, seconded by Alderman PORTER, the retiring Auditor (Mr. Samuel Wood) was re-appointed.

The Bill in Parliament.

An Extraordinary Meeting was then held to consider, and if thought fit, to approve, of the Bill deposited in Parliament. In his speech at the ordinary meeting, the Chairman explained the purposes of the Bill; the main one being the acquisition of land and the construction of works at Erith.

Dr. BLYTH (Messrs. Blyth, Dutton, Hartley, and Blyth), the Solicitor, having given a digest of the clauses of the Bill,

The CHAIRMAN moved that it be approved, subject to such alterations as Parliament may make and the Directors may assent to.

Sir FORTESCUE FLANNERY, in seconding the motion, first thanked the proprietors on behalf of Mr. Boraston and himself for their re-election. Their duties were extremely pleasant; for their proceedings were characterized by the utmost harmony and goodwill. He always felt how difficult it would be for anyone to sit in the seat of the late Sir George Livesey; and he confessed that he hardly expected that any member of the Board formerly associated with Sir George would be able to fulfil these duties so well, having regard to the strong man who preceded him. In regard to the Bill, he (Sir Fortescue) was responsible for its formal introduction into Parliament; and he never had any parliamentary duty which he undertook with more confidence in it being based upon sound and right lines. He believed it was prepared in the interests of both proprietors and consumers, not merely in their interests of to-day, but in those of the future—the distant, as well as the immediate, future. The Directors had now provided for improvements and progress for a good many years to come, if they succeeded, as they thought they would do, in getting first of all the approval of the proprietors, and then the approval of Parliament to this purchase of land, and to the other facilities for which they asked authority. The Board examined not only this site, but several other sites with river frontage; and it was evident to them all that this site presented advantages superior to those of any other site, and which they believed were valuable. They had here a good river frontage, and connection with the railway and fairly good roads, so that, if desired, they could use road transport as well as railway and marine transport. Broadly speaking, the Board had confidence that the property the Company were acquiring was suitable, and that it would ultimately produce substantial benefits to the prosperity of the Company.

Colonel B. LATTER thought it hardly possible that any proprietor could have any doubt as to the desirability of what the Directors were attempting to carry out by means of this Bill. It seemed so obvious that the concentration of the advantages Sir Fortescue Flannery had described must be beneficial to the Company all round—not only in the way of economy, but of efficiency, because in the hands of a capable Board like theirs economy must be an ally of efficiency. There was one thing that surprised him—that was, the clause in the Bill authorizing an increase, or decrease, in the number of the Directors. It seemed to show rather a change of opinion, on the part of the Board, in the course of the last two years. On the occasion of the Amalgamation Act, it was, he thought, decidedly the opinion of the Directors that the Board was already large enough. He was glad to see there was a change of opinion, because he believed—and he was not alone in his belief—that, for a Company of this size, the Board, as it had been up to the present, had been rather on the small side than otherwise. This was probably the last occasion upon which one gentleman now sitting at the Board would be present in the capacity of a Director at a half-yearly meeting—the gentleman [Mr. Alexander Dickson] who was appointed to sit on the Board for the statutory period of two years. His term of service would expire, he (Colonel Latter) believed, on Aug. 1, so that it was possible he would not be sitting at the Board when next the proprietors met. It would be a nice thing if the representation of the Bromley district, which was a large and important one, could be continued; and it might be done by now filling up the existing vacancy. Mr. Dickson was in every way able and fitted to be a member of an altogether capable Board; and he (Colonel Latter) therefore asked the Directors to consider the point he had raised.

Alderman PORTER said he certainly was in favour of the Bill going forward, and it seemed to him to be a very business-like proceeding, as when the works were developed at Erith there must be a considerable saving in the transit of materials. In the matter of electricity, he took it the Company would not be able to supply any outside authority. He also inquired as to whether the Bill was likely to meet with any opposition.

The CHAIRMAN remarked that they were hopeful it would not.

Mr. R. GARRAWAY RICE remarked that the advantages of a site like the one proposed to be taken were so obvious that it was hardly necessary for anyone to point them out. The key of the whole thing was that the Company would get water carriage. He was connected with another Company who had a good frontage to the Thames; and they got coals delivered on to the works cheaper than they would do if they were inland. It seemed to him that the site was an altogether good one, and that they would have little opposition from their neighbours. It was extremely gratifying to him, as an old Director of the West Kent Company, to hear the Chairman say they were doing so well in the district.

Mr. G. WICKS observed that many of the proprietors, knowing the valuable services of Mr. Dickson to the old Bromley Company, welcomed the suggestion made by Colonel Latter; and he hoped the Directors would give it favourable consideration.

The CHAIRMAN remarked that the Board were much obliged to the proprietors for the expression of their opinions. He might say that the matter to which Colonel Latter had referred would receive careful attention. Mr. Dickson had proved himself an able and excellent colleague; and they would be very sorry to lose him. That was all he (the Chairman) could at present say.

The motion was unanimously carried.

MEDICAL PRACTITIONERS AND GAS-FIRES.

Dr. SIDNEY TURNER proposed a vote of thanks to the Chairman and his colleagues for their services during a very trying time. The Chairman referred to the National Gas Exhibition last October at Shepherd's Bush; and he was very pleased to see there the advances that had been made in the application of gas, especially in gas-fires, as he believed that was the direction in which they could largely look for business developments. Gas-fires formerly relied upon heating by convection more than by radiation, and that was where the trouble came in; radiation being the correct form of domestic heating. He was glad to find that there were now fires that gave them 50 per cent. and upwards of the heat developed by the combustion of the gas in the form of radiant heat. He also bore testimony to the hygienic efficiency of modern gas-fires.

Dr. BARKWELL seconded the motion; Alderman PORTER supported it; and it was cordially passed.

The CHAIRMAN said the Board were much obliged for the kind vote of thanks. They were very glad to hear the remarks of Dr. Turner, seeing that the gas-fire was likely to be the domestic heating agent of the future. At one time doctors looked askance at gas-fires; and he was pleased that their attitude had entirely changed. Medical gentlemen all over their district were now strong supporters of gas-fires. A pleasurable duty remained to him. That was to propose a hearty vote of thanks to the officers and the employees. Never had there been a time when the proprietors were more indebted to them for their hearty good will and co-operation; and he could safely say never had there been a time when that good will and hearty co-operation had been so well manifested. Mr. Shoubridge they all knew well, having had experience of him for many years. On several occasions now, he (the Chairman) had had to testify to his zeal and devotion to the services of the Company. Mr. Wastell had completed his probationary period; and he (the Chairman) need only say the Directors were fully satisfied with the way Mr. Wastell had carried out his duties. The Directors felt that they had in him a valuable officer. The same spirit that was found in the chief officers animated the whole of the large staff and employees.

Mr. HAROLD GUNDRY seconded the motion, which was heartily carried.

Mr. S. Y. SHOUBRIDGE, on behalf of the engineering staff and employees, thanked the Chairman for his kind words, and the proprietors for the hearty way in which they had received them and the motion. He assured them all that it was very encouraging and stimulating to know that their efforts were always so heartily appreciated by the proprietors.

Mr. WASTELL said he was sure the staff would feel doubly gratified at this kind expression of approbation of their services, seeing that the report and accounts were not exactly gilt-edged. It would hearten them to endeavour to redouble their efforts for the proprietors and consumers generally.

BRENTFORD GAS COMPANY.

The Half-Yearly Meeting of the Company was held last Friday, at St. Ermin's Hotel, Caxton Street, S.W.—Mr. R. J. NEVILLE NEVILLE, M.P., in the chair.

The SECRETARY (Mr. John T. Croxford) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said the Directors thought the latter were as favourable as any gas company could wish to present to their shareholders at the present time. It had been a year of great anxiety for all gas companies; and if they looked at the returns which had been made by others—such as the Gas Light and Coke and South Metropolitan—they would feel that the Brentford Company had enjoyed at all events as great a measure of success as, if not greater than, these.

THE HIGH PRICE OF COAL.

It had been a year of excessive stringency in the coal market. The Company were charged last year a higher price for coal than had been the case for the last sixteen years. He took 1898 for comparison, because this was the year when they last increased their capital, so that it formed a convenient period from which to date the more recent history of the Company. During these sixteen years, the price of coal had never been so high by about 1s. per ton as last year. The price was, in fact, 4s. 7d. per ton higher than the lowest price in this period, and 2s. 6d. per ton higher than the average price. In addition to this, it had not been a very successful time with regard to residuals. The coke market had been a difficult one, because oil had largely increased in price, with the result that all companies who could manage to do without it did so. This had meant the carbonizing of more coal and a glut in the coke market. The Directors, however, thought that they had done very fairly well with regard to coke, because the less amount that had been received in the past half year, as compared with the same half of the previous year, was quite moderate.

POSITION SHOWN BY THE ACCOUNTS.

The position of the accounts, taking it quite broadly, was that they had not made their dividend by a sum of £11,000. Coal had cost £13,000 more, repairs and maintenance of works and plant and material had cost £6000 more; and they had been so extraordinarily generous to the consumers that they had reduced the price of gas 1d. per 1000 cubic feet, which had taken something like another £6000. In fact, in this way they were able to account for about £26,000 difference between the present accounts and those for the last half of 1912. But the increase experienced in the sales of gas, and in the make of gas per ton (which was one of the most satisfactory features of the recent accounts of the Company), had reduced what might have been a falling off of £26,000 to £11,000. The net result of 1913 was that, taking the first half year and the second half year together, they had made their dividend for the whole twelve months, although they had reduced the price of gas and had had to pay so much more for coal. Actually, they had made their dividend with £2000 over. In the face of the reports of other companies, he felt sure the shareholders would be satisfied that they had not been badly served by the officials and employees of the Brentford Company. A considerable sum of money had also been spent in renewals of meters and repairs and maintenance—they were about £3200 up there. The policy of the Board had been to keep the plant and manufacturing capacity up to the very highest level; and they had during the last three or four years made an "intelligent anticipation of the future." They had, as far as possible, dealt with their plant so that if, and when, their Bill was passed they might be able to concentrate on new business, and not be called upon, as they had been in the past, to spend such large sums on repairs and renewals, and things of this sort. One of the most satisfactory points about the past half-year's accounts was the increase in stove and meter rents. There was, as compared with the same period of 1912, an increase of 11½ per cent. The actual increase of gas and meter rental—in spite of the reduction they had made (and there had been a reduction in the price of gas of 5d. in four years, which was a very considerable one, and one of which they might reasonably be proud)—was 2·12 per cent.; and the increase in the quantity of gas sent out was 4·26 per cent.

CONDITION AT THE BRENTFORD WORKS.

The Brentford site was now as full of plant as it could be. There was not a single bit of ground on which anything further could be placed. The site had been very largely re-organized in the past half year, and work had been carried out which it was anticipated would result in great economy in the handling of stoves. No further extension of the plant could, however, be undertaken. The maximum day's make had amounted to 14,900,000 cubic feet; and the average for a whole week, during the cold snap this year, had been 14,500,000 cubic feet per day. In fact, the plant had been so hard-pushed that they actually had not the means of supplying the whole amount of gas required. They were fortunate in having the Gaslight and Coke Company close at hand; and they were able, by joining up their pipes to those of that Company, to take 9,000,000 cubic feet of gas, which permitted them to supply everybody. He mentioned this to show they were just about up to the hilt with regard to their manufacturing capacity; and they would have this year, owing to the normal increase (which for the present quarter was 8¾ per cent.), to spend a considerable sum on augmenting their plant, whether or not the Bill was passed. They must get another 1 million cubic feet capacity per day, as otherwise they would be unable to perform their statutory obligations. The capital of the Company had been increased since 1898 by £233,000, which was an increase of 26 per cent. During the same period, the increase in the make of gas had been 118 per cent., or 7 8 per cent. per annum. This proved that the capital expended in these sixteen years had been spent in the most economical manner.

EXTRA COST OF WORKING AT SOUTHALL.

What had been troubling the Directors was Southall. There was a great difference between the cost of coal at Southall and at Brentford. Southall was well situated in some ways; and it would be a very useful station if there were not more useful stations to be had. It was on the Grand Junction Canal; and there were twelve locks between it and the Thames. Every barge had to pay toll to pass through these; and the result of this and the increased cost of handling was that the price of coal was about 1s. 3d. per ton higher than at Brentford. It was necessary to keep a larger supply of coal at Southall than at Brentford, because there was no room to store it at the latter station—it was simply carbonized straight out of the barge. This was, of course, extremely economical, because it saved the cost of handling. Every increase they had must be met from Southall, because they could not extend the plant at Brentford. They were carbonizing 2 tons at Southall already for every 1 ton at Brentford; and if the Company was going to increase in the future as in the past, the time would come when it would be 3 or 4 tons at Southall to 1 ton at Brentford. This would send up the cost of coal. At the present time the difference in cost between Southall and Brentford made a difference of 10d. per ton over the whole quantity dealt with. This was one of the chief factors which the Directors had in their minds when they decided to promote a Bill.

Mr. R. SHAFTO ADAIR formally seconded the motion.

Mr. A. W. OKE referred to the satisfactory nature of the working of the Company, and asked what was the make of gas per ton of coal. Also whether there was an increased dividend for the proprietors owing to the reduction in the price of gas.

Mr. FINNIS pointed out that "Purification, £1837" was the same on this occasion as in the 1912 half year, and asked whether this was a coincidence, or whether there was a fixed charge.

The CHAIRMAN replied that it was a coincidence, and showed how economically the work was done. They purified more gas at the same cost. The amount of gas they were selling per ton of coal carbonized

was 12,700 cubic feet, as compared with 11,924 cubic feet the previous year; so that they were some 800 cubic feet up, which was equal to about 17d. per ton. The maximum dividend was being paid at the present time. It could not be altered unless a reduction had been in force for a whole year. The last reduction having been made in April, they were not in a position to get the benefit of it until next April. In the Bill they were proposing to alter this, and make the change take effect every six months.

Mr. RICHMOND offered a few remarks in support of the motion, which was then carried unanimously.

Proposed by the CHAIRMAN, and seconded by Mr. ADAIR, a dividend was declared (subject to income-tax) at the rate of 5 per cent. per annum on the 5 per cent. preference stock, at the rate of 14 per cent. per annum on the consolidated stock, and at the rate of 11 per cent. per annum on the new (1881) stock.

The retiring Directors (Colonel A. H. Warlters Cowie and Mr. H. E. Griffith) were next re-elected, on the motion of the CHAIRMAN, seconded by Mr. ADAIR; and, on the proposition of Mr. S. SPENCER, seconded by Mr. RICHARDS, the Auditors (Messrs. Monier F. Monier-Williams and Alfred Bevis) were also re-appointed.

The Company's Bill.

An Extraordinary Meeting was then held, for the purpose of considering, and, if thought fit, approving, (1) the Bill to consolidate and convert the capital of the Company, to authorize the acquisition of the undertakings of the Staines and Egham Gas Company and the Sunbury Gas Company, to confer further powers, and for other purposes; and (2) agreements for the acquisition of the undertakings named.

The CHAIRMAN, in moving a long resolution approving of the Bill and the agreements referred to, went fully into the aims and objects of the Company, and explained the provisions of the Bill, which have already been set forth in the columns of the "JOURNAL" [*ante*, p. 78]. He pointed out that the business was increasing so rapidly now that the Company were anyway faced with an expenditure of capital. If, however, the Bill was passed, they hoped to be able to spend this capital more economically than would be possible without the Bill. The foundation of the Bill really was that the Directors had had offered to them a chance which would never again arise in the lifetime of the Company. Everyone knew that the prime cost of coal was the most important thing in connection with the manufacture of gas; and, as he had already stated, they were at the present time handicapped in this respect. The Board had had offered to them (and they had been for several years considering the matter) land lower down the River Thames by 3 miles than Brentford. It was quite close to Barnes Bridge, and was 90 acres in extent. It was a desirable site from their point of view; and favourable arrangements had been made for acquiring it from the Duke of Devonshire. It would, of course, be three or four years before the Company could make use of the increased facilities which the new site would give them. If Parliament sanctioned the purchase, the Directors thought they saw their way, simply by the savings it would be possible to effect in carriage, to get sufficient money to pay the interest, and probably more than the interest, on the sum of money which it would be necessary to pay for it. Again, works could be laid out to-day infinitely more economically than was the case twenty, or even ten, years ago; so there was good opportunity here for considerable saving. The plans for the works would be drawn up to secure the economical handling of coal, coke, and residuals, in a way the Company had so far never been able to do, in consequence of being hampered as he had told them. At the present time the Company had 49 square miles of territory. Some parts of it were densely populated, while others were not, and portions never would be. But London was moving westward; and the Directors thought their Company ought to move westward too. Therefore they had entered into agreements to amalgamate with undertakings on their borders which, though not just now offering a large amount of increase, did offer such increase if they were properly worked, as they would be with Mr. A. A. Johnston as their Engineer. ["Hear, hear."] They had also taken the opportunity of dealing with their capital, by splitting it, which he thought would render it more attractive to the public, and more easily handled. When the two Companies he had referred to were taken over, the shareholders would receive stock in the Brentford Company. Further, the Company were taking powers under the Bill to supply electricity, because there were certain municipalities in their district whom they believed might be willing to transfer their powers to the Company; and they felt that they ought to be in a position to avail themselves of any opportunity that might arise. They would not, however, undertake electricity supply unless they felt sure that they would not lose anything, but rather gain. They were also seeking authority to supply power gas, which it might under certain circumstances become desirable for them to do.

Some questions were put, and the CHAIRMAN replied to them, after which Mr. ADAIR seconded the resolution, and it was unanimously agreed to.

The proceedings concluded with a hearty vote of thanks (on the proposition of Mr. FINNIS, seconded by Mr. RICHARDS, and supported by Mr. SPENCER) to the Chairman, Directors, and staff.

The CHAIRMAN, in acknowledgment, said the real mainspring of the Company was their Engineer, Mr. Johnston. The staff, and also all the employees (who, of course, were included in the vote) were doing their very best to make the Company the success which it was and would continue to be.

Surface Workers' Pay in Northumberland.—The coalowners of the county have intimated to the Northumberland Miners' Association that they will not go beyond their recent offer, made after negotiations with the union leaders, to make up to 3s. per day the wages of surface men, between the ages of 21 and 65, who are not now earning this amount. Referring to the decision, the Secretary of the Association said that, unless something better was offered by the owners generally to the surface men of the county, it was not unlikely that at a fitting time there would be another national strike at the coal mines.

BRISTOL GAS COMPANY.

Annual Meeting of Shareholders.

Before commencing the formal proceedings at the annual meeting of the Bristol Gas Company last Thursday, the Chairman (Mr. Fenwick Richards) referred to the fact that they had lost three Directors since the last annual meeting. Early in the year they lost Mr. Hewitt, who had been a member of the Board for five years. Within a fortnight of his death, they lost their late Chairman, who had been associated with the Board for upwards of twenty-two years, and the greater part of which period he was in the chair. Mr. Dix was very well known in the city; and doubtless all the shareholders could form an opinion as to how much his loss had been felt by the Directors. Then, only a fortnight ago, there passed away the junior member of the Board, Mr. James M'Murtrie, whose business capacity was so great that, although he had been a Director for only eight months, he had thoroughly mastered the details of the Company's management and business. The Chairman then proceeded to move the adoption of the report and accounts, remarking that what he had to say would also form the subject of remark by chairmen of companies up and down the country—namely, that they had suffered a good deal from the high price of coal. There had been an increased expenditure thus caused of £53,000 during the year; and there had been an increase in wages from £20,000 in 1912 to £22,000 in 1913—principally owing to the amount of coal carbonized, and not to any other cause. There had also been a large item of expenditure in connection with the Stapleton Road Gas-Works. It would be recollected that the retort-house at these works was decided to be reconstructed; and the work was to have been commenced in July, 1912, and finished in about twelve or fifteen months. The contract was duly signed; but from various causes the work was not actually commenced until November of that year, with the result that no certificate for contractor's outlay came into the 1912 accounts. The idea originally was that some £14,000 or £15,000 would have been paid in 1912 to the account of the contractor. But the whole sum was brought into the accounts of last year. The Stapleton Road retort-house cost £33,522; and the indebtedness had all been met. The 1912 and 1913 accounts had enabled them to pay the usual dividends, and at the end of the latter year to carry forward something to reserve. On the credit side there had been an increase of 92 million feet of gas, with a corresponding increase financially of over £8000. Recent appreciation in the securities in which the Company had invested had made good the depreciation they suffered in the year 1913. He moved the adoption of the report and accounts.

The motion was agreed to; then the dividend recommended was agreed to; and the retiring Directors were re-elected. One of them was Mr. John Phillips, who thus continues in his joint office of Secretary and Director.

GAS AND WATER COMPANIES REPORTS AND ACCOUNTS.

SOME OF THE CHIEF ITEMS OF NOTE.

Bath Gas Company.—Out of the balance of net profit of £29,035 (after paying an interim dividend for the first six months of last year, and interest on the debenture stock to Dec. 31, also transferring £2000 to the superannuation fund, and allowing £2302 for depreciation on investments) the Directors of this Company recommend a dividend of 5 per cent. for the second half year. In their report, to be submitted at to-morrow's meeting of shareholders, the Board say: "The large increase in the consumption of gas recorded in 1912 has been maintained; and there is a small further increase for 1913. The mild weather in the autumn affected the demand, and also the sale of coke. The receipts for residuals on the whole, however, show an improvement. There has been a considerable increase in the price of coal and oil; and this has added largely to the year's cost of manufacture. But your Directors are glad to be able to continue to supply gas at the low price of 1s. 10d. per 1000 cubic feet. Employees who have been in the Company's service for a long time have in the past been granted a pension in their old age; and for this purpose the Directors have during the year set aside the sum of £2000."

Bournemouth Gas and Water Company.—Next Friday the shareholders of this Company meet in London for their 87th ordinary general meeting. In their report the Directors point out that the Bill promoted by the Company in the last session of Parliament received the Royal Assent in August; and the undertakings of the Wimborne Minster Water Company and the Christchurch Gas Company are now in course of acquisition and will be taken over (as from the 1st ult.) so soon as the legal and other formalities are completed. The price payable for the Christchurch undertaking has not yet been determined by the Arbitrator. After writing-off £3500 for works superseded, the Directors will recommend the payment of dividends of 6 per cent. on the preference shares, 7 per cent. on the ordinary shares, and 16 per cent. per annum on the original shares. These dividends will amount to £18,558 and leave £33,048 to be carried forward.

Coatbridge Gas Company.—The seventy-first annual meeting of this Company was held last Tuesday. The Chairman, in submitting the Directors' report for the year 1913, commented on the continued increase in the use of gas. In 1912 the increase was fully 26 million cubic feet; and in 1913 almost 25 millions. The works were equipped to meet a still larger demand. The rates for gas would be continued during the present year at 1s. 6d. per 1000 cubic feet for lighting, cooking, &c., and 1s. 4d. for motive power. It was mentioned that Mr. Thomas Wilson had been laid aside for some time by serious illness, but was now convalescent. Dividends at the rate of 13 per

cent. on the original stock and 9·1 per cent. on the three issues of £10 shares were declared.

Chester United Gas Company.—The shareholders of this Company met yesterday (Monday), when it was reported that, owing to the continued expansion of business and the increased demand for gas for domestic purposes, the Directors had deemed it necessary to lay a new feed main to supply the northern portion of the district. This will, it is said, very materially augment the existing distributing system, and enable the Company to maintain a much more uniform pressure in the supply of gas throughout their whole area. Preparations are being made for this to be done before next winter. The Directors have also placed orders for the supply and erection of new retort-charging machines; and other alterations will be made which will allow of the adoption of improved methods for the carbonization of coals. "Considerable economy will be effected by the working of the new machines; and it is anticipated that they will facilitate the securing of a more regular output from the retort-beds, and at the same time considerably ease the labour in the house." It is hoped to have the new machines in operation at the commencement of the summer. The balance to the credit of the profit and loss account, after providing for interest on the debenture stock and dividends on the preference stock to the end of December, was £6450; and the Directors recommended the payment of a further dividend on the ordinary stock, making, with the interim dividend paid in August, the maximum rate of 5 per cent. for the year.

Croydon Gas Company.—At the 134th half-yearly meeting of this Company next Friday the Directors will report that for the second half of 1913, the sales of gas exceeded those of the corresponding period of 1912 by 3·42 per cent. The number of consumers increased in the half year by 1073; that of stoves on hire by 547 cookers and 2046 fires; while 91 and 282 cookers and fires respectively have been sold to consumers—representing a total increase in gas-stoves of 2966. Some of the condensing and washing plant which has been in use since 1866, is being reconstructed; and is very nearly completed. The Company's facilities for gas storage are now heavily taxed—the last gasholder having been erected twenty years ago, since which year the annual output of gas has trebled. The Directors have accordingly decided to construct an additional holder with a capacity of 6½ million cubic feet; and the building of the tank has been commenced. After providing for all fixed charges, there remains available for division a balance of £48,937; and the Directors recommend that dividends for last half year shall be declared at the rates per cent. per annum of: "A" stock, 15; "B" and "C" stocks, 12; "D" stock, 5; "E" stock, 10—all less income-tax. These dividends will absorb the sum of £23,599; leaving a balance of £25,338 to be carried to the next account.

Exeter Gas Company.—A balance on the revenue account, of £10,638, for the year 1913 (total expenditure, £61,715; total receipts, £72,353) will enable the Directors of this Company, at next Monday's meeting of the shareholders, to recommend the payment of a dividend of 10 per cent. on the £40,000 of original stock and one of 7 per cent. on the £46,500 of new ordinary shares. The quantity of gas sold last year was over 17 millions more than in 1912.

Ipswich Gas Company.—At next Monday's meeting of this Company the Directors will recommend dividends at the full statutory rates, which will allow of a carry-forward of £11,581. Sales of gas increased largely last year, and the receipts from residuals were satisfactory. The price of coal and all kinds of materials ruled high; but, in the view of the Board, "there are not wanting signs that coal will be cheaper." Turning to personal matters, the Directors in their report (after recording the death of Mr. William Alexander, J.P., after 45 years' service) say: Their Manager and Secretary, Mr. John T. Jolliffe, having reached the age of 70 years, has placed his resignation in their hands. The Directors feel that, during his 27 years of control, Mr. Jolliffe has managed the undertaking with marked ability and success; and in accepting his resignation, which is to take effect at the end of March, they propose to signify their appreciation of his services by making a substantial addition to the pension to which he is entitled under the superannuation scheme, and by offering him the vacant seat on the Board, which he has agreed to accept, so as to secure the advantage of his experience and counsel. The Directors have decided to divide the duties of Manager and Secretary; and they have appointed Mr. Frank Prentice (who has been in the service of the Company for 32 years) as Manager and Engineer, and Mr. George A. Mallett (who has been in the service of the Company for 29 years) as Secretary; and they have every reason to believe that these appointments will make for the continued prosperity of the Company.

Portsea Island Gas Company.—At Thursday's meeting of shareholders the Directors will report that the past half-year's working showed a further marked development of the Company's business; but the abnormal prices of coal and the depressed coke market militated against the financial advantages of the increased quantity of gas sold. The report continues: For the reasons mentioned in their last report, the Directors have decided upon the erection of new chief offices and showrooms; and the work will be commenced without delay. Convenient premises to serve as temporary offices have been secured. The recent expenditure on new manufacturing plant, to provide for the ever-growing demand for gas, necessitates the provision of additional capital; and a further 300 "D" shares will be offered for sale by tender at an early date. The Engineer and General Manager (Mr. J. D. Ashworth) reports that the Company's buildings and plant at the several stations, and also the mains and meters, have been adequately maintained and are in efficient working order. The profit and loss account shows an available balance of £41,575, which enables the Directors to recommend dividends at the following rates per annum: 13 per cent. on the "A" and "B" shares; 12 per cent. on the "C" shares; 10 per cent. on the "D" and "E" shares; and 5 per cent. on the 5 per cent. (maximum) stock—leaving a balance of £23,643 to be carried forward.

Reading Gas Company.—The shareholders of this Company meet next Tuesday, when the Directors will recommend dividends of 5 per cent. on the preference and ordinary stocks for the past year. The sales of gas for the twelve months increased by 33,260,400 cubic feet (or 5·21 per cent.); but, on the other hand, the prices obtained for residuals in the latter part of the year were less satisfactory, while the contracts for coal and oil were made at considerably higher prices. The Directors, in their report, say they found themselves in a position, on the completion of the accounts for the June half year, to reduce the price of gas to all consumers—making the seventh consecutive reduction since July, 1903, when the price stood at 3s. per 1000 cubic feet; the present price being 2s. 3d. Owing to the continuous and steady expansion of the Company's business, further extensions in the plant will be required; and the Directors have under consideration the question of providing additional storage accommodation in the near future. The Company's mains were extended during last year to Sonning, Woodley, and Theale—thus further linking-up the Company's area of supply.

Scarborough Gas Company.—The shareholders of this Company met last Saturday to receive the Directors' report for the past year. It showed that, after providing for interest charges and the dividends on the preference stock, the payment was proposed of the usual dividends on the ordinary stocks at the rate of 5 per cent. per annum. There will be left a balance on the profit and loss account of £3207 to carry forward. The sale of gas for the year was over 5 million cubic feet more than in the previous twelve months, which "shows that the large increase in consumption obtained in 1912 owing to the coal strike has been more than retained." During the past year the extensions to the workshops of the town department were completed; and "the additional accommodation is proving of great advantage to the Company, and affording better facilities for coping with the increased work of the department." The manufacturing and distribution plant has been maintained (under the Manager and Secretary, Mr. Alexander Allan) in "an efficient condition—extensive renewals having been carried out at the works."

Sheffield United Gaslight Company.—The report of the Directors of this Company, to be presented to the 114th ordinary general meeting of shareholders on the 9th prox., states that, as compared with 1912, the gas sold during the past year showed an increase of 364,568,000 cubic feet, or 8·63 per cent. The increases in the sales in 1911 and 1912 were 8·13 per cent. and 6·13 per cent. respectively. "It will thus be seen that the business of the Company has of late years rapidly progressed. This is not surprising when the numerous uses to which gas is now applied are taken into consideration; the low price in Sheffield rendering it a most economical agent for lighting, heating, motive power, and other trade purposes." The average price at which gas has been sold during the past twelve months is 1s. 1·48d. per 1000 cubic feet. Notwithstanding these excellent results, it will—owing to the high price paid for coal and the increased cost for labour, &c.—be necessary, in order to pay the dividend, to take from the balance carried forward from previous years the sum of £12,367.

South Shields Gas Company.—From the report of the Directors of this Company, to be presented to the shareholders next Thursday, it appears that the revenue last year amounted to £110,601; and the expenditure to £87,634. With the amount brought into the accounts and interest on money on deposit there is a sum of £40,382 to be apportioned. This will allow a dividend of 8½ per cent. on the consolidated and new stocks, 5¾ per cent. on the ordinary stock, and interest on mortgages, &c., and still leave £19,271 to be carried forward. The quantity of gas sold was greater than in any previous year—viz., 560,431,170 cubic feet, or an increase of 17,796,549 cubic feet (3·28 per cent.) over 1912, which constituted the then record. The receipts from gas and residuals yielded an increase of £5533; but coals, oil, &c., cost £7167 more than the previous year. The report mentions that an extension and reconstruction scheme at the Jarrow works has now been commenced to cope with the increased demand for gas.

South Staffordshire Water Company.—According to the report of the Directors of this Company, to be submitted at next Tuesday's meeting of the proprietors at Birmingham, the number of houses laid on to the mains during 1913 was 936; showing an increase (after deducting 210 houses in Quinton transferred to the Birmingham Corporation) to 143,267 supplies. The gross amount of water-rates for the year was £154,429, as against £153,336 in the previous year. After providing for interest on the debenture stock and dividend on the preference stock, the amount remaining on the revenue account (including £8459 brought from the previous year) is £51,240. This allows the payment of a dividend of 6½ per cent. on the ordinary stock, amounting to £21,889, and leaves £7622 to the credit of next year. The report of the Engineer (Mr. H. Ashton Hill, M.Inst.C.E.) is to the effect that the whole of the machinery, buildings, and plant of the Company are at the present time in substantial order and repair.

Wellington (Salop) Gas Company.—The report of the Directors of this Company for the year 1913 states that the revenue was £11,074, and the expenditure £8373; leaving a surplus of £2701, out of which a dividend will be paid, making with the interim dividend £5 18s. 9d. per annum. The increase in the quantity of gas sold during the year was 6½ per cent. The large increase in the cost of coal, which it is pointed out has amounted to 45 per cent. over the past seven years (25 per cent. since 1911) coupled with the fall in the price of coke and sulphate of ammonia, make it unlikely that any further reduction in price can be made to the consumers—certainly while coal and other commodities are at the present high figures.

West Cheshire Water Company.—The shareholders of this Company meet on Thursday, at Birkenhead, for their 29th annual meeting. On last year's accounts there was a balance of £9406, which, with

£8816 brought forward from the previous year (less the interim dividends of 5 per cent. per annum paid in August), will allow the Directors to recommend the payment of another dividend at the same rate, and leave a balance of £12,221 to be carried forward to the next account.

York Gas Company.—Next Thursday the shareholders of this Company hold their 69th annual meeting. The accounts to be submitted show a profit for the year of £18,539, with a carry-forward from 1912 of £15,670. After providing for all preferential charges and a dividend on the consolidated stock of £4 4s. per cent., there will be a balance to bring into this year's accounts of £15,139. There was an increase of gas sold compared with the year 1912 of 11,500,000 cubic feet. New and supplementary mains extending to 8680 yards were laid, and further old mains relaid; 379 meters were fixed for new consumers; and 1234 additional cookers, grillers, &c., and 655 gas fires and radiators were supplied. In the course of their report, the Board say: Since the last meeting of the Company Mr. J. R. Hill has resigned the office of Chairman which he filled so ably and worthily for fourteen years; and while the Directors much regretted his retirement from the position, it has been a great satisfaction that he has remained a member of the Board—thus continuing to the Company the benefit of his long experience. The Board have elected Mr. Alfred Procter to fill his place. The Board also report that, for reasons of health, Mr. J. H. Hill retired from the position of Manager and Secretary, and they record their high appreciation of his zeal and devotion to the interests of the Company during a faithful service in various capacities of forty-seven years. To fill his place the Board elected Mr. Harold E. Bloor, B.Sc., B.Eng., the Engineer and Manager of the Carlisle Gas-Works, out of 69 applicants, and appointed him to be Engineer, Manager, and Secretary.

A TEN YEARS' LIGHTING CONTRACT AT READING.

The Gas Company's Success.

The Reading Town Council resumed on Thursday evening the discussion on the public lighting contract which was adjourned from the previous week. The matter arose on a report by the Public Streets Improvement Sub-Committee to the Highways and Lighting Committee, who recommended the Council to adopt it. The report [which was reproduced on p. 381 of last week's "JOURNAL"] concluded with the following: "We are satisfied that the Gas Company's tender is the more favourable to the Corporation, both as regards cost and illumination; and we therefore recommend its acceptance for a period of ten years from April 1 next."

Several members took part in the discussion. One objected to the term of the contract, and expressed the opinion that the Council would be well advised if they accepted the offer of the Gas Company, but limited it to five years. In reply, however, it was pointed out that the Electric Company would not compete unless it was a ten years' contract. Mr. Collier remarked that the Committee had in no way shown favour to one Company or the other. He believed they would get exceedingly good illumination, greatly in excess of what they had at present, and at a saving of £550 a year. Had they accepted a five years' contract, they would have had to pay £500 a year more for the light; and this was the point which decided them to accept the ten years' contract.

The report was adopted by 27 votes to three.

DUBLIN GAS COMPANY'S POSITION.

At the time of the publication of the last half-yearly report of the Directors of the Alliance and Dublin Consumers' Gas Company, Mr. F. J. Dickens, a shareholder, addressed a circular to the proprietors [see "JOURNAL" for Sept. 30, 1913, p. 942], in which he referred to the "steady and persistent fall" that had taken place in the shares, and said he had obtained the consent of the Board to send over an independent expert to make a thorough investigation.

The expert nominated by Mr. Dickens on behalf of the shareholders was Mr. W. Newbigging, of Manchester; and in a further circular Mr. Dickens adds that the Board also appointed Mr. W. R. Herring, of London, to act along with Mr. Newbigging. The inquiry and preparation of the report have taken much longer than was anticipated; but Mr. Dickens hopes, with other Lancashire shareholders, to discuss the latter with the Directors in the course of the next two or three weeks. Meanwhile, as possibly the shareholders may receive the half-yearly balance-sheet very shortly, accompanied by the usual proxy, he earnestly requests them not to fill up their proxies in favour of the Directors until they hear the result of the conference.

New Water-Works for Portland.—The Chairman of the Portland Urban District Council (Mr. W. Edwards) recently opened the new water-works for Portland, the approximate cost of which is put at £15,785. The pumping-station is situated in the valley, and the most modern machinery for lifting water has been installed. The Engineer of the scheme is Mr. R. S. Henshaw, who has been congratulated on the skill and ability shown in the construction of the works.

Agitation against Electricity at Aylesbury.—The petition that is being promoted at Aylesbury against the Council's electric lighting scheme last week bore 2100 signatures. When it is remembered that 1452 ratepayers formerly voted for the scheme, the 2100 signatures to the petition is a remarkable indication as to the direction of public opinion after more mature consideration. Those who are opposing the scheme have their eyes on the question as to what will happen in the way of increased rates if the Council are allowed to go their headstrong course in this matter. From the ratepayers' point of view, if electricity is wanted, then let those who require it form a company for the purpose of supplying it.

THE BLACKBURN GAS STRIKE.

The seventh week of the Blackburn gas workers' strike still finds the Corporation determined not to be coerced into granting "concessions" to the labourers; the Committee already having quite voluntarily (as the result of Mr. John Bond's comparisons between Hollinwood and Blackburn conditions of employment) offered to raise the wages of different grades of skilled workers to an amount in excess of that asked for originally by Mr. J. R. Clynes, M.P.—the Lancashire District Secretary of the National Union of Gas Workers' and General Labourers' Union—on behalf of the men.

At the week-end, however, it was stated with some degree of authority that the position was regarded as being more hopeful than for some few weeks past. Meanwhile, the supply of gas continues to improve, and yesterday the mills and workshops resumed their accustomed service. For the last six weeks the factories have been running only from daylight to dusk; the loss to each of the 15,000 or 16,000 operatives being averaged at about 10s. per week—roughly, between £50,000 and £60,000 in wages alone.

The executive of the Blackburn Trades Council have communicated with the Mayor (Alderman Higginson, J.P.) with a view to arranging a conference with him, in order to see if some way cannot be found out of the present *impasse*. So far as can be ascertained, the purpose of certain unofficial "conversations" which have taken place between a prominent member of the Corporation on the one side, and a leading Union official on the other, is to arrive at a basis on which a return to work can be arranged without unconditional surrender on the part of the men, always having regard to the basis that the Corporation will not sacrifice the principle for which they have all along contended—that the standard rate of wages of labourers in the district is one beyond which they cannot, and will not, go. At the moment of writing (says our Manchester Correspondent), it is difficult to see how a middle course is to be attained, for the offer of the Labour members of the Council to accept ¼d. per hour advance, instead of ½d., was refused several weeks ago by the Council. Be that as it may, however, negotiations for peace are certainly proceeding privately.

A leading local journal points out that "many of the strikers know that, on account of the introduction of new labour-saving machinery [into the Street-Cleansing Department], they have not the slightest chance of re-employment at their old jobs. . . . These men are, therefore, determined, as far as they can, to prolong the dispute for the sake of the strike pay, which would, of course, cease if the Corporation and the men came to terms."

The full service of cars, throughout the whole of the Blackburn district, was resumed at 5 o'clock yesterday morning. The service has been curtailed for six weeks.

VERTICAL RETORTS FOR KENDAL.

A Woodall-Duckham Installation.

The Kendal Town Council are about to make application to the Local Government Board for sanction to borrow £9000 for the installation of two settings of four vertical retorts, in place of four of the present benches of seven horizontal retorts, and for leave to extend repayment of the loan over an equated period of twenty years. Subject to the requisite sanction being granted, the tender of the Woodall-Duckham Vertical Retort and Oven Construction Company, Limited, at a price of £8843, has been accepted; and the Manager (Mr. W. R. Wilson) has been instructed to draw up plans of the scheme.

These decisions were arrived at by the Council at their last monthly meeting, on the recommendation of the Gas and Water Committee, who reported that in the autumn of 1912 they were faced with the fact that one-third of the carbonizing plant was worn out and would require rebuilding from the foundations; this portion being part of the original plant purchased by the Corporation in 1894, and the remaining portion having already been rebuilt. The estimated cost of this renewal was found to be £2500. A second important consideration was that the system of hand-charged horizontal retorts was extravagant in working, and showed a poor return of gas per ton of coal carbonized in comparison with more modern systems. At the same time it was felt that the existing labour conditions were extremely unsatisfactory. With these considerations in view, the Committee began an inquiry as to how improvements might be made. They first considered the system of mechanical stoking with horizontal retorts, and paid a visit to Skipton, where they saw the De Brouwer charger. This method shows considerable advantage over the old system of hand-stoking; and the Committee were much impressed with it. The attention of the Committee was then drawn to the most recent method of carbonization—viz., by means of vertical retorts. The advantages of vertical retorts over the old system of horizontals, as in use at Kendal, are numerous: Increased make of gas per ton of coal carbonized; retort charging by gravitation; low fuel consumption; previously wasted heat of coke utilized for heating the secondary air; coke improved, and of greater value; cool condition of coke when discharged; high and constant calorific value of gas; increased yield of tar and ammonia; improved labour conditions at considerably reduced cost; longer life of retorts; largely reduced annual upkeep; less naphthalene and inert gases formed; no nuisance from dust, flame, steam, smoke, or noise. The estimated saving by the adoption of the Woodall-Duckham system was: Saving on coal, £495; on labour, £669; on repairs, £200—total £1364, less interest and sinking fund on £9000 at 3¾ per cent. interest based on twenty years' redemption, £648. Total saving, £716. After prolonged consideration, the Sub-Committee appointed to obtain tenders and report, unanimously recommended the Committee to adopt this system; and the recommendation was unanimously adopted by the Committee.

When the adoption of the Committee's minutes had been moved, Mr. Pennington said that, though he quite agreed with the work of the Committee, he had not been able to satisfy himself that the vertical retort system was the best; and because he was not satisfied, he would

refrain from voting upon it. Mr. Thomas asked several questions; and Mr. Farrer, in reply, said that both the continuous vertical systems investigated were exceedingly good, and it was with difficulty that the Committee came to a decision that the Woodall-Duckham system best suited them. The prospective gains had been put by the Manager at as low a figure as possible, to be on the safe side. The Committee felt confident they were taking a right step, which would result in a considerable saving to the town. Under the new system the conditions of labour would be vastly improved. Mr. Pattinson, too, pointed out that they were faced with an expenditure of £2500 in any case, which would have left them with their labour conditions unaltered. When the scheme was carried out, they would, he agreed, be better off. Alderman Abbatt spoke in the same strain, and remarked that they hoped in a few years' time to be able to double the amount paid from the gas-works to the rates. Experience proved that in other towns where the system was in operation the results were financially satisfactory; and the Council would never regret going in for Woodall-Duckham verticals. Other members also supported the resolution.

When replying to the discussion, Alderman Monkhouse reminded the Council that he was the pioneer of the purchase of the gas-works. At that time he made statements which were conservative in tone and which had been ten to twenty times improved on; and ever since the works were started they had been a source of profit. He would like to indulge in recalling some of the things written in the literature of that day, when he was told that there could be nothing but a loss of £1550 annually on the expenditure of £80,550. But when he looked back at such silly, nonsensical statements in face of the facts, he could laugh. When he told them that the modest estimate of one of the best experts put the value of the gas-works at £120,000, and they only stood then at £57,000, they could see what an increased asset it was. In the early days he stood quite alone in his advocacy of the gas policy. He was delighted to see the gas-works such a prosperous concern. He was satisfied the present scheme was in the right direction. The improvement in the labour conditions, as had been remarked, was marvellous.

The minutes of the Committee were then adopted.

BECKENHAM AND GAS-STOVE FLUES.

The Council's Regulations.

As the result of the fatality at Beckenham a couple of years ago, when two servant girls were asphyxiated by the fumes from a gas-stove, bye-laws relating to ventilation have been framed by the Urban District Council for application to new buildings; and these came up for confirmation at a meeting last week. It is recalled that the pipe to carry away the fumes from a gas-stove in a greenhouse ran up the wall of the house above the greenhouse and then entered the chimney in the girls' bedroom. Instead of bending and going up the shaft some distance, the pipe pointed straight out into a room behind the register. Expert witnesses stated that the gases given off descended when cold, and as the register was open they came into the bedroom. There was at the time some criticism of the local authority for not having safeguarding regulations which would prevent pipes being so fixed; and the matter was thereupon taken up in committee—the present bye-laws being the outcome.

Mr. C. E. Baker proposed the adoption of the bye-laws, and said at the same time he would like the Council to agree to some representation being made to the Gas Company that they should also put into force regulations whereby gas and stove fittings and other things supplied by them should be properly fixed and ventilated. He thought it was a duty of any gas company who supplied these things, just as it was of the local authority, to see that the fittings were properly put in and kept in good order. He knew in some cases gas companies and local authorities were now alive to the risks which might be run through improper fittings. He thought that gas companies should co-operate with them in seeing that stoves, &c., were well fitted and kept in proper order, and that suitable ventilation was provided. They would remember the discussion which took place, and the blame which was thrown upon the local authority of Beckenham, some time ago in regard to the fatal accident. He did not think the blame thrown upon them on that occasion was fair. He moved that in adopting the bye-laws representations be made to the South Suburban Gas Company to also make bye-laws with regard to the proper fitting of gas-stoves, &c.; and this was agreed to.

MARSH GAS IN BRADFORD.

An Unusual Street-Lamp.

There was reproduced in the "JOURNAL" a fortnight ago an account of some strange experiences in Bradford; a number of explosions having occurred in different houses in consequence, so Professor Kendall stated, of marsh gas (probably from coal seams) coming out of the ground. A fall in the barometer last Wednesday brought with it a recurrence of these disquieting events, and from ten to a dozen houses were affected.

Possibly, however, the most interesting experience was in connection with a public lamp in Laburnum Street, round the standard of which a bluish flame was burning. The flame began in the lantern, and burst the glass. Officials of the Gas Department were summoned; but it was seen that the colour of the flame was dissimilar from that caused by coal gas. The coal gas was turned off; but the blaze from the top continued to burn. It was then extinguished, the lantern was removed, and a short piece of piping was placed in the top of the standard, embedded in soft clay so that no gas could escape except through the pipe. A lighted match was applied, and the flame shot up again. It was surmised that gas had accumulated under the stone-paved street, and was escaping up the lamp standard. The flame was once more put out and with the aid of a length of rubber tubing, a bowl of clear water, and a few glass bottles, samples of the gas were taken and some experiments made by Mr. Charles Wood (the Gas Engineer) and other officials. It was noted that the gas was entirely odourless; and none of the distinguishing characteristics of coal gas were detected. In conversation with a representative of the "Yorkshire Observer," Mr. Wood remarked that the gas seemed to be pure marsh gas. He could make no guess as to the source, but he thought it advisable that the emission from the street-lamp standard should be allowed to burn, as it would draw some quantity of the gas away from the houses.

STOCKPORT CORPORATION GAS UNDERTAKING.

The Allocation of Gas Profits.

Reference was made at last week's meeting of the Stockport Town Council to the subscription of £115 by the Corporation to the British Commercial Gas Association. Mr. Councillor Padmore asked what the benefits were of the subscription.

Alderman Fernley (Chairman of the Gas Committee) replied that the "B.C.G.A." was a new Association formed for advertising the advantages of the use of gas. They were having severe competition with electricity, and the "B.C.G.A." had been formed to assist gas undertakings generally. The amount mentioned was their proportion; and there was no doubt the Association was doing important work.

The question whether municipalities should make large profits out of their gas undertakings and apply them to the relief of rates rather than still further reduce the price of gas to consumers, was also discussed at the same meeting.

Alderman Graham championed the cause of cheaper gas. Last year, he said, the income-tax paid upon the gas profits was £2583; and he calculated that the profit must have been about £43,000, of which £12,000 went to the relief of the rates. It should be the policy of the Gas Committee to charge a fair and reasonable amount for gas; and if money was needed by other Committees for public purposes, they should get it by direct taxation.

Alderman Fernley said the question was a "hardy annual," and had been discussed every year for the last ten years. The amount which went in relief of rates from the gas undertaking was the dividend of the ratepayers, who found the capital and took the risks. The charges for gas in Stockport compared most favourably with those in other towns. The income-tax was upon the gross profits of the gas undertaking. One proportion of the profits went to the relief of the rates, and the other to the reserve fund.

The hiring-out of gas-cookers free of charge was also advocated, but the proposal was negatived.

HULL GAS SUPPLY.

In the course of his annual report for 1913, to the Water and Ga Committee of the Kingston-upon-Hull Corporation, Mr. Charles B Newton, M.Inst.C.E., F.C.S., their Water and Gas Engineer, gives some statistics relating to the three statutory districts into which the city is divided; Mr. John Young, the Engineer and Manager of the British Gaslight Company, and Mr. David Wood, the Manager and Secretary of the East Hull Gas Company, having again supplied particulars of their respective undertakings.

The Corporation "old town" district consumed 88,551,000 cubic feet of gas (purchased from the British Gas Company), through 1298 ordinary and 373 prepayment meters. Their mileage of mains was 6½; and 371 public lamps were supplied.

The British Gas Company carbonized at Hull 145,206 tons of coal, producing 1,561,788,000 cubic feet of gas. The consumers numbered 19,309 with ordinary meters and 29,194 with prepayment meters. There are 178 miles of mains and 4168 public lamps in the Company's district.

The East Hull Gas Company made 329,170,000 cubic feet from 24,396 tons of coal. The ordinary and prepayment meters in use were 3297 and 8410 respectively. The number of public lamps coupled-up to the 62 miles of mains in their district numbered 1424.

Sedgley Gas Undertaking.

The accounts of the Sedgley Urban District Council gas undertaking for the past year have been approved by the District Auditor (Mr. E. W. Hicks). From them it appears that the balances at the commencement of the year came to £2873. Gas sales amounted to £5563, receipts from gas-fittings to £273, and those from residuals to £1527. There was a total income of £10,317. The expenditure included coal, lime, &c., £3264; wages of workmen, £1076; rents, rates, taxes, and insurance, £318; salaries, £429; instalment of gas loans repaid, £1034; interest on loans, £240. A sum of £500 has been given to the rates.

Price of Gas in Belfast.—The Belfast Corporation Gas Committee lately received a deputation from the Belfast and Ulster Licensed Vintners' Association, to protest against the surplus profits of the gas undertaking being given towards the relief of rates, and to ask for a reduction in the price of gas. Afterwards a motion to reduce the price of gas to all consumers by 5 per cent., in addition to the usual discount, was met by an amendment that consideration of the matter be delayed until the coal and oil contracts had been settled; and the amendment was carried. Notice was given by Mr. J. A. Doran of a motion for a reduction of the price of gas by 10 per cent., the charging of auto-meter supplies at the same rate as ordinary supplies, and the providing of incandescent mantles free of charge.

A DEVONSHIRE AMALGAMATION SCHEME.

The "Three Towns" Gas and Water Supply Undertakings.

A proposal for a Provisional Order to amalgamate the Three Towns —Plymouth, Devonport, and Stonehouse—has been the subject of a Local Government Board inquiry, in the course of which a good deal has been heard about the water supply of these places, and something also in regard to the gas and electricity undertakings. The scheme is put forward by Plymouth, which is a county borough, and is strongly opposed by Devonport, which is also a county borough; while Stonehouse, governed by an Urban District Council, takes the attitude that it is willing to be absorbed if there is a union of the three towns, but not to be joined with Plymouth alone.

The water question furnished a remarkable illustration of the manner in which the interests of the neighbouring towns are interwoven. Both the Plymouth and Devonport Corporations own water-works, the supplies being derived from adjoining areas of Dartmoor; the streams and pipes running side by side for many miles. Plymouth supplies water to Stonehouse and also to St. Budeaux, a district now incorporated in the borough of Devonport; while in another portion of Devonport, the district of Pennycross, the two authorities are in competition for the supply of water. Stonehouse gets its gas from Plymouth—the town being within the area of the Plymouth and Stonehouse Gas Company; but electricity is supplied by Devonport, whose municipal electricity works have been built in the Stonehouse area. These anomalies were touched upon by many of the witnesses.

Duplicate Water Supplies.

Mr. J. H. Ellis, the Town Clerk of Plymouth, pointed out that the part of Devonport which derives its water supply from Plymouth is about one-third of the total area of the borough, while Plymouth has also the right to supply water to ships in Devonport Harbour. The question of amalgamating the Plymouth water-works with those of Devonport had, he said, occupied attention for many years. As long ago as 1848 it was advocated by Mr. Beardmore, an eminent water engineer; and it was suggested in 1902 when the Devonport Corporation purchased the undertaking of the Devonport Water Company. It was elicited in cross-examination that, on that occasion, Mr. Ellis gave evidence in support of the case of the Water Company, who went to Parliament for powers to extend their works and make a large storage reservoir. He explained, however, that his opinion was that there was no need for either the scheme of the Company or that of the Corporation, and that his object was to sell the water of the Plymouth Corporation. The question of a Joint Water Board had been considered, but Plymouth was not in favour of it. It did not want union with Devonport for water purposes only. He admitted that the works which the Devonport Corporation had carried out and had in contemplation for the improvement of the supply were necessary, if the towns were to remain independent; but why should they construct works and reservoirs when they could come to Plymouth for water?

A similar opinion was expressed by Mr. A. B. Pilling, the Clerk to the Metropolitan Water Board, who was Town Clerk of Devonport from 1897 to 1903, and was intimately connected with the negotiations which took place about that period in regard to the water question. If he had stayed at Devonport he would have sought to bring about an arrangement with Plymouth with regard to the water. He considered then, as he considered now, that Devonport came out of Parliament in 1902 with something in the nature of a pledge to see that a union of the water undertakings should be accomplished; and he would have endeavoured to redeem that pledge. There were other questions on which the union of the towns was desirable; and if joint action could not be obtained at less price than the amalgamation of the three towns, he was of opinion that this was a proper course to take.

Mr. Frank Howarth, the Water Engineer for Plymouth, went into the matter in more detail, giving statistics of the area of supply, the consumption, and so on. It appeared from his statement that the average daily consumption of water in the Plymouth district was 6,869,000 gallons per day in 1913—the maximum in one day being 7,860,000 gallons, on July 28. In that year the Corporation had an average of 9,600,000 gallons a day to spare; and, assuming that there was a very dry year like 1887, they would have about 2,000,000 gallons a day in excess of their requirements. In Devonport the consumption per head was 40·91 gallons per day, against 48·6 gallons in Plymouth. Mr. Howarth thought it would be possible to bring the consumption in Plymouth down to practically the same rate as in Devonport; the difference being largely due to wastage caused by leaky fittings and old pipes. On several occasions between 1895 and 1911 the Plymouth Corporation had assisted the Devonport water undertaking by supplying water; but now the Devonport Corporation had spent £18,600 on a main in substitution for part of the Leat, and £34,000 on a new reservoir. If the towns had been united, this money need not have been spent, said Mr. Howarth, but might have been utilized for a new aqueduct for the distribution of water from the Plymouth storage reservoir, which was sufficient in size to supply the three towns not only now, but even with an increase in the population of 68,000. If the supplies were amalgamated, such an aqueduct would be necessary, because, though there was plenty of water, there was not sufficient carrying capacity for the requirements of Plymouth *plus* the extra quantity required for Devonport. When the population increased to such an extent that more storage was needed, he would raise the dams of the existing Burrator reservoir. By increasing the height of the dams by 6 feet, they could get 200,000,000 gallons extra storage, which would last the united populations for twenty years. The dams could be safely raised 10 feet if necessary. Mr. Howarth admitted in cross-examination that Devonport water was filtered, and that supplied to Plymouth was not. Filtration, he admitted, would improve it; but it was not necessary. It was a fact that the absence of filtration, and even of screening, had the effect of causing slimy deposits in the pipes. If the undertakings were united, he should still utilize the Devonport supply as at present. The cost of raising the height of the water level in the reservoir he estimated at £20,000, which would meet the requirements of the next twenty years for storage; while by spending £60,000 they would meet the needs of the next twenty years for conveyance. If amalgamation did not take place, he was of opinion that Devonport must spend an enormous sum of money within a comparatively short time in improving its water supply.

Mr. H. Francis, the Engineer and Manager of the Devonport Water-Works Company, said that, since the Corporation took over the works in 1906, the position in regard to the supply of water had not improved, and no provision had been made for the future. It was suggested by the Devonport Corporation in 1902 that the two authorities should combine for the full utilization of the watershed; and, if they did not do so, Devonport must construct a new reservoir and pipe the part of the Leat now open.

Financial and Engineering Aspects.

Mr. William Cash, of London, giving evidence as to the financial aspect of the question, said that Plymouth had spent £386,000 on its water-works and Devonport £340,000. Plymouth had a storage reservoir, and Devonport none. But, on the other hand, it must be remembered that, while Plymouth was the original owner of its works, Devonport purchased its undertaking at a recent date as a going concern. In Plymouth, for a house rated at £20 a year, the charge for water was 16s., which was equivalent to a rate of 9½d. in the pound; in Devonport, it was 30s., or a rate of 1s. 6d.; and in Stonehouse 25s., or a rate of 1s. 3d. If the towns were amalgamated, it would not be fair and proper, even if it could be done with justice, to equalize the water-rate. If it were done, the present profit at Plymouth would be wiped-out, and they would be left with a deficiency of £4000. Mr. Cash was asked in cross examination if it was not a fact that Devonport had a reserve fund of £8600 on its water-works, while Plymouth had no reserve fund, and what would happen in that case if the Plymouth reservoir dam burst. His answer was that if the dam of one of the Devonport reservoirs burst the reserve fund of £8600 would not go far to repair it. It was true that Devonport added £214 to its reserve fund last year; but Plymouth then had a profit of £7600 in aid of rates.

When it came to the turn of Devonport to put its views on this part of the case forward, it was contended by Mr. Balfour Browne, K.C., that Plymouth had a surplus of only 1,000,000 gallons of water a day, and that the time would shortly come when it would require further works. Devonport, too, would need extensions; and in order to meet the requirements of the district in the most economical way, there should be a Joint Water Board. Water, it was urged, was one bribe held out by Plymouth. A uniform water-rate would mean a matter of 6½d. in the pound; but Counsel argued that Plymouth was not philanthropically inclined in offering to bear Devonport's burden to this extent.

Mr. Blackall, the Mayor of Devonport, who is also Chairman of the Water Committee, pointed out in his evidence that the undertaking had not been a charge on the rates; and though the capital charges were high, the revenue was expanding.

Engineering evidence on the subject was given by Mr. F. W. Lillicrap, the Water Engineer to the Devonport Corporation, and by Mr. G. Midgley Taylor (Messrs. John Taylor and Sons, Westminster). Mr. Lillicrap said that, owing to want of gauges, there are no accurate figures of the yield of the Devonport gathering ground; but considering the very large area from which water was drawn he thought it quite safe to go on without a storage reservoir. The present supply of water would be sufficient for many years. It was proposed to put in about five miles of pipes in place of the Leat, which would have the effect of saving 500,000 gallons of water per day now lost through leakage and evaporation.

Raising the Burrator Dam.

Mr. Taylor said he calculated that the present supply would not be sufficient for the needs of Devonport in 1923; and he advised the extension of the pipe-line in place of the Leat, with a length of tunnelling under Princetown to shorten the distance. These works should be taken in hand at once; and after they were carried out the Water Engineer should direct his attention to the discovery of further means of supply beyond 1923. An impounding reservoir would be necessary. He did not consider that Plymouth had any surplus water; and as to the raising of the dam, he viewed it with the gravest apprehension. The Plymouth reservoir was designed with the factor of safety by two of the most eminent engineers in the country, and to raise the dam 6 or 10 feet might precipitate disaster. He agreed that the best course was for the towns to join together in the provision of a water supply.

This evidence led to the calling by Plymouth of Mr. Edward Sandeman, who was formerly Water Engineer to the Plymouth Corporation and designed the Burrator works and superintended their construction. He said that his design for the Burrator dam was submitted to Mr. Mansergh, who thought it might be made thinner by 5 feet. Eventually about 2 ft. 6 in. were taken off; but this still left a very high factor of safety, and the height could be raised 16 feet without danger. The margin of safety would be less; but it would still be quite sufficient.

Mr. Honoratus Lloyd, K.C., summing up this part of the case on behalf of Plymouth, said that Devonport had done practically nothing to provide for the shortage of water, which admittedly existed 16 years ago. Plymouth, it was said, would also have to incur fresh expenditure; but if this were so, it was surely better that they should join together than go to the expense of providing separate works.

Gas Supplies.

The question of the gas and electricity supplies received less attention. Indeed, practically all that was said as to the electricity undertakings was that the two works were on different systems—one being on the alternating and the other on the continuous current system; so that although they were both municipally owned, they could not be joined up. As to the gas-works, Devonport made a point of the fact that its undertaking was municipal property, and that this was an asset which must be taken into account. Alderman J. C. Tozer, the Chairman of the Devonport Gas Committee, pointed out in his evidence that the Corporation had had to expend a very large sum in improving the

works since they acquired them; but they had made a profit in most years, and had reduced the price of gas to 2s. 4d. per 1000 cubic feet—the lowest price ever charged in Devonport. It was pointed out by Counsel representing Plymouth that the charge in Devonport was considerably in excess of the 1s. 9d. per 1000 cubic feet charged by the Plymouth Gas Company. The Mayor of Devonport, who was cross-examined on this point, admitted that the price was considerably higher, but contended that Devonport must ultimately benefit by the possession of the gas undertaking, which, as an asset, was constantly increasing in value.

Mr. Isaac Carr, the Engineer of the Widnes Gas-Works and Consulting Gas Engineer to the Devonport Corporation, was called to speak of the present position of the works. He said they had been reconstructed, and were up to date, and, with the new methods introduced, should be able to manufacture gas at the same price as Plymouth. The present year's trading would, he anticipated, result in a profit of £2500. Considering the time the works had been in the hands of the Corporation, and the heavy outlay necessary for reconstruction, the recovery in respect of capital was remarkable. In cross-examination, Mr. Carr said that, considering the location of Plymouth, he thought the Company sold gas at a fairly low price. His own view was that gas should be sold to the consumer as cheap as possible, and a profit should not be extracted from him to pay other people's rates.

From the Plymouth point of view, it was argued that it was better to have cheap gas now than to look for benefits which might or might not accrue in future from municipal ownership of the gas undertaking. Mr. Honoratus Lloyd, in dealing with this part of the case, said that although it was no doubt advisable that the local authority should own the water undertaking, it by no means followed that the gas supply should be in their hands. As they had in Plymouth one of the best and most economical supplies in the country, it would be monstrous for the Corporation to purchase the undertaking, and then have to raise the price of gas. The Plymouth consumers were very much better off than those of Devonport; and it was inconceivable that people on one side of the street would go on taking gas at 2s. 4d. while those on the other side were paying 1s. 9d. There would be a constant outcry until the price was brought down to the level of Plymouth; and as the reduction of 2d. per 1000 cubic feet in Devonport last year was followed by a loss of £2300, the prospect of the gas undertaking yielding a profit for the relief of the rates was remote.

The matter now awaits the decision of the Local Government Board. It is understood that if a Provisional Order is granted, the Devonport Corporation will carry its opposition into Parliament, and contest it to the end.

SMOKELESS FUELS.

A lecture was delivered by Mr. WALTER GRAFTON, the Assistant-Manager of the Glasgow Corporation Gas Department, in the Langside Hall, Glasgow, on Tuesday last, under the auspices of the Smoke Abatement League.

Mr. Grafton first of all dealt with the formation of fog, and the wasteful methods of using coal which produce soot and smoke. Of solid fuels, he said, anthracite appears to be the only one that can be termed "smokeless." It is a good steam raiser, and in specially designed grates is an excellent domestic fuel. He exhibited samples of paraffin coke which, though costly and difficult to regulate, is greatly prized for domestic use. Then he referred to the use of gas-works coke for domestic purposes, and showed samples of vertical-retort coke, which, he mentioned, kindles easily in any grate. If the open grate is to be retained, Mr. Grafton said the best solid fuel to use is a mixture of coal and coke, or coke only, which can be most readily kindled to a red heat by means of a coal-gas flame. Consumers look to those methods of heating which bring about the least expense and trouble; and he believes that this is why smokeless fuels which can be used in an existing grate without extra expense—and this applies equally to gas—appear to offer the most likely solution of the smoke abatement problem. He stated that only about 19 per cent. of heat from a coal-fire is imparted to the room; while with good, smokeless, easily combustible gas coke, 44 per cent. of heat is sent out.

Dealing with hot-water circulators, the lecturer said that, with the ordinary coal-fire, a supply of hot water is not always available; and even if the coal-fire were attended to throughout the day to maintain a proper supply of hot water, which might never be required, it is a wasteful practice. Therefore, gas water-heaters, circulators, &c., appear to overcome the drawbacks of the coal-fire for water-heating purposes, as they give an instantaneous supply of hot water, though when large quantities are required coke is the most economical.

Mr. Grafton spoke of the necessity for specially trained salesmen to deal with the sales side of the gas business since it has become so complex in its character. As to gas-fires, he said that the idea of them being unhealthy is simply a survival of the days when gas-heated stoves were badly made, badly fitted, and badly used. Properly constructed and properly fixed gas-fires have been pronounced by the most eminent medical men to be as healthy as coal-fires; and in consumptive hospitals they are to be found in daily use.

Gas-cookers were also dealt with; and with regard to gas-radiators, Mr. Grafton said he was of opinion that they should have a casing round the sides, so that a draught would be caused to pass up the columns to pick up the heat and convey it into the room. He showed two gas-fires of the same size and design—one connected to a ½-inch supply pipe and the other to a ¼-inch pipe—indicating the marked comparison between a poor supply and an adequate one.

Deal Gas and Electricity Bill.—At a special meeting of the Deal Town Council, it was decided that the Deal and Walmer Gas and Electricity Bill should be opposed. The Mayor stated that there was a probability that the Corporation would be able to obtain electricity in bulk from the generating station at Tilmanstone and ultimately Snowdown, and distribute current on far more favourable terms than those proposed in the Bill of the Company.

DECORATIONS FOR GALLANTRY.

The Notting Hill Gas Fatality.

A long list of decorations for acts of gallantry were made by His Majesty the King at Buckingham Palace last Thursday; and among them we are pleased to note that medals were awarded to four members of the London Fire Brigade for combined services under circumstances which are detailed as below in the Court Circular. Their plucky action was recorded in the "JOURNAL" at the time.

Alfred George Peck and Alfred Dawson Gordon (sub-officers) and Arthur Edward Barber and William James Newberry (firemen), of the London Fire Brigade, showed conspicuous gallantry on March 18, 1913, in attempting to save life on the occasion of an escape of gas in a sewer in the following circumstances: Five workmen, while working in a sewer, were overcome by gas escaping from a gas-main. Four were rescued, but the fifth could not be found. Firemen were then employed to search for the missing man; and two of them were killed by the gas. Newberry descended into the sewer twice, wearing a smoke-helmet, and on the second occasion found the body of Fireman Maclaren, removed the line from himself, and placed it round Maclaren to get him out. On attempting to use the line to signal for help, he found it jammed, and thereupon removed the mouthpiece of his helmet to shout for help, and immediately collapsed. Barber accompanied Newberry on his second descent, also wearing a smoke-helmet. When the line became jammed, he crawled back and cleared it, and in returning struck his helmet against the roof, thus rendering it useless. He went on and reached Newberry just as the latter collapsed. Though feeling faint himself, Barber succeeded by a great effort in dragging Newberry out of the small sewer to the bell-mouth at the junction of the roads and thereby saved his life. Peck and Gordon descended into the sewer, though not protected by smoke-helmets, and remained for more than an hour in an atmosphere charged with poisonous gas searching for the missing workmen and for their two comrades. They found the body of Fireman Maclaren, and Gordon endeavoured to drag him out of the sewer, but was obliged to desist from weakness, caused by the gas. As Gordon was in a state of collapse, Peck remained with him until help came, by which time he was himself completely overcome.

BOLTON AND DARWEN WATER ARBITRATION.

The Case for the Respondents.

An outline of the case for the Bolton Corporation in the recent arbitration between them and the Darwen Corporation was given on pp. 308-10 of the "JOURNAL" for the 3rd inst.; and this is now followed by an indication of the facts and arguments adduced on behalf of Darwen.

The proceedings, it may be mentioned, took place at the Surveyors' Institution, Westminster; and it will also be recalled that the point to be decided was the price which the Darwen Corporation are to pay to the Bolton Corporation for the supply of 300,000 gallons of water a day, delivered at a point on the boundary of Darwen. In 1905 the Bolton Corporation obtained an Act authorizing them, among other things, to construct additional water-works; and in this, at the request of the Darwen Corporation, the Committee inserted the following section (28): "At the expiration of the period of eight years from the passing of this Act, the Corporation shall supply and continue to supply to the Corporation of Darwen at such point on the boundary of the borough of Darwen as that Corporation may reasonably require, and that Corporation shall continue to receive, and pay for, a quantity of water per day of 300,000 gallons; and the price to be paid for such water by the Corporation of Darwen and the point of supply shall, if not agreed upon, be determined by a water engineer to be appointed in case of difference by the Local Government Board. In determining the matters referred to in this section, the said water engineer shall have regard to all the circumstances of the case."

Mr. H. HOWARD HUMPHREYS acted as Arbitrator. Mr. BALFOUR BROWNE, K.C., and Mr. W. J. JEEVES (instructed by Messrs. Dyson and Co., Agents for the Town Clerk of Bolton) appeared for the Bolton Corporation; and Mr. E. SUTTON and Mr. RAITH SUTTON (instructed by the Town Clerk) represented the Darwen Corporation.

Mr. SUTTON, in presenting the case for Darwen, said the question was one of very great complexity and difficulty. He did not think that the Arbitrator could have been called upon to deal with a matter which presented greater difficulties. There had apparently been a remarkable want of accurate information on the part of everyone before the Act of 1905 was passed; and the Act itself presented considerable difficulties in its interpretation. It would be necessary to decide what was the proper principle, and what were the proper matters, for the Arbitrator to take into account in arriving at a conclusion on the question submitted to him—namely, what was a fair figure to be charged by Bolton to Darwen for 300,000 gallons of water a day which Parliament had imposed upon Bolton the obligation to supply to Darwen. The Corporation of Bolton had presented their view; and he was going to ask the tribunal to decide that this view was a totally mistaken one. Bolton had claimed Darwen as being in a sense partners; but they had excluded them from profits, and they had excluded them from contributing to the sinking fund, because Darwen had nothing to do with the works. In arriving at the charge, except for these matters Bolton had treated Darwen as partners; and here he claimed was the fundamental fallacy which made the whole of their tables of very little use. They had thrown upon Darwen the sole and exclusive liability to pay for works that were intended for Darwen's sole benefit—*i.e.*, the rising main—and they had at the same time asked the Arbitrator to saddle Darwen with the costs that were exclusively for the benefit of Bolton, and from which Darwen did not receive one farthing of profit of any sort. How were these two propositions to be reconciled? It

was now admitted on all hands that Darwen could not be considered as contributing to the sinking fund, because they had no interest in the property. Did one ever hear of a partner with no interest in the partnership property? Bolton asked the Arbitrator to enter into a speculative inquiry, right down to 1945, as to what the probable position of affairs with reference to the water undertaking would be; but if Parliament did not make Darwen partners in the scheme, all this inquiry would become irrelevant. And Parliament did not do so. The section said: "At the expiration of the period of eight years from the passing of this Act," &c. It was at the expiration of these eight years that the Arbitrator had to take the position of affairs; and he was to "have regard to all the circumstances of the case" existing when he was called upon to make his award. The Act made no provision at all for taking into consideration circumstances that might arise twenty years hence. It put the parties in the position of vendor and purchaser—a perfectly well-known and well-understood relationship, as different from the relationship of one partner and another as that of master and servant was different from buyer and seller. And if the Arbitrator took them as vendor and purchaser, instead of as partners, he had to consider what the state of things was at the moment the sale took place. One of the main difficulties between the parties depended upon the fact that they were not partners, as Bolton had stated, but were vendors and purchasers at a particular date—eight years after the passing of the Act. Why was this date fixed? Because eight years was the time by which it was reasonable to suppose the Delph reservoir would have been completed. This was a very important point. From the evidence, it appeared that Bolton were at the time of the Act in considerable want of water; and if they had given the 300,000 gallons at once, they would have been deprived of this quantity when they had nothing to take its place. But if it was given after the Delph reservoir had been completed, then they would have for the supply of Bolton at that moment a reservoir which would yield them 1,600,000 gallons, after allowing for the compensation water; so that they would not be put to any inconvenience in supplying Darwen with 300,000 gallons from the Entwistle reservoir or from the Cadshaw Brook. As a matter of fact, Bolton was receiving from the Entwistle reservoir a great deal more water than they thought they were receiving when Parliament imposed upon them the obligation to give 300,000 gallons to Darwen.

The ARBITRATOR: I think that is pretty generally admitted.

Mr. BALFOUR BROWNE: The difference is 540,000 gallons a day; and I suppose that was intended to be caught and paid out of Cadshaw. As Cadshaw is unnecessary, it can be caught and paid out of Entwistle.

After some further discussion had taken place upon this point,

Mr. *Lewis Mitchell* was recalled to clear up the matter. He said there was some error in the report prepared by the late Engineer in 1905. The capacity of the Entwistle reservoir was given as 625,000,000 gallons, whereas it had been proved to be 762,000,000 gallons. He (witness) had arrived at the yield of the gathering-ground by taking the area of the reservoir multiplied by the available rainfall; and this gave 1,406,679,450 gallons per annum from the total gathering-ground, or an average of 3,853,916 gallons per day. The discrepancy in the capacity of the reservoir had nothing whatever to do with the yield of the gathering-ground.

Mr. SUTTON remarked that Parliament had said Darwen were to have 300,000 gallons supplied to them out of a certain quantity of water, at what was a fair and right price; and it now appeared that, instead of being supplied out of a certain quantity, they were to be supplied out of a larger quantity, so that the loss to Bolton was so much less. Mr. Watson had stated that the Entwistle reservoir could control the whole of the watershed; and therefore for ordinary purposes it would not be necessary to have the Cadshaw reservoir. No doubt this was so. But having the Cadshaw reservoir, and filling it when the whole of the water was not required at Entwistle, would give an additional supply of 217,000,000 gallons; and it was idle to say that this would not be an available supply of water to have in addition to the water from the rainfall itself. It would, of course, be folly to make the reservoir if it was going to cost £115,000, but not if it were only going to cost £65,000. What he claimed was that the Arbitrator must take it that at the time when Parliament passed the Act of 1905 these facts were not known, and it was presumed the Cadshaw reservoir would be made, would prove useful, and would contain 217,000,000 gallons. Where, therefore, would be the proper place from which to supply Darwen? From the Cadshaw reservoir, and from water that found its origin falling upon ground that was within Darwen's own boundary. He was not there to say that, because this reservoir could not be made, the tribunal was to calculate on anything except existing facts. One of the results of Bolton not being able to deliver the water higher up the stream by gravitation or otherwise was that Darwen had to get it all delivered to them at a point from which it had to be pumped. He did not resist the proposition that as this pumping, &c., was necessary for the Darwen supply, and for that alone, Darwen should pay for it; but if they were to pay for works which were exclusively for their benefit, it was on the basis that Bolton should pay entirely for works that were solely for her benefit. Otherwise it would be a most unjust position for the two parties to be placed in. The only other works necessary for the supply of Darwen were the Entwistle and Wayoh reservoirs and the rising main. Bolton said they intended to supply them exclusively from the Delph reservoir when it was completed; but how could they say this, seeing that if they did not have the Entwistle and the Wayoh water they would want the whole of Delph themselves? The works he had mentioned enabled Darwen to be supplied from what he ventured to call Darwen's water—namely, Cadshaw Brook. There was nothing in the Act which said Darwen should be supplied only from the new works. They knew what was the cost of the works he had referred to; and there were no speculative calculations involved. Moreover, they knew the available yield. Next with reference to the 12½ per cent., which Bolton wished to add to the cost of the water for contingencies, &c. They were asking the Arbitrator to say that Darwen should contribute towards risks of accidents that might occur anywhere in Bolton, in connection with works for the construction of which Darwen were not in any way responsible. By what principle could anyone who was merely a purchaser be subjected to these risks? He admitted the charge for management. Bolton seemed to have put their case forward and dealt with it in a way which would enable them to charge an exhorbitant rate for the water they were supplying to Darwen. The figure he was going to submit was something like 6½d. per 1000 gallons. The case was a complicated one, and required to be looked at from all points of view.

Mr. *Jabez Beckett*, Borough Accountant and Treasurer of Accrington, replying to Mr. RAITH SUTTON, said the estimated population of Bolton was less now than it was six years ago. The credit of Bolton very properly stood high, and she was in a position to borrow on as easy terms as any authority in the North of England. As to the 12½ per cent. addition which had been referred to, there was nothing to support the charge for reserve fund, or that for contingencies. In fact, they were both for the same purpose. In respect of these two items, Bolton had not thought it worth her while to make any provision since 1870. What profits had been made had been consumed in the reduction of local taxation, in the way of rate-aid; so that it had not impressed them as being a very necessary thing until now. Between 1870 and the time when they went to Parliament for the Act of 1905, they had actually utilized in reducing local taxation £335,000; and it was not until they came to compile the tables for the present proceedings that it occurred to them to make this provision. Witness put in a statement showing the gross cost of water supplied in Darwen for each of the five years to 1912-13, the quantity of water supplied, the estimated quantity available, and the net cost (less redemption charges) per 1000 gallons supplied. This showed that the cost at the reservoir in 1908-9 was 5·83d. per 1000 gallons; in 1912-13, 4·297d. These figures were extracted from the accounts of the Darwen Corporation, and they indicated the gross cost of the water supplied within their area. They simply showed what water was costing in Darwen to-day.

The ARBITRATOR remarked that, to make these figures of value, one really wanted to know the analogy by way of engineering to be drawn between the works at Bolton and those at Darwen; and he had no knowledge at all of the latter.

Witness was cross-examined by Mr. JEEVES to show that if the works belonging to Darwen were constructed to-day, the cost would be much more, and that this would increase the cost of the water, as shown in his table. He was also questioned at great length regarding his criticism of various figures put forward by the other side.

Mr. *E. M. Eaton*, questioned by Mr. SUTTON, said he had a long acquaintance with the Bolton Water-Works. He was in the committee rooms during the whole of the proceedings on the 1905 Bill; but Darwen had not consulted him directly until the present inquiry. In his estimates of what the 300,000 gallons a day cost, he had taken the Entwistle and Delph schemes as being the only two by means of which Bolton, under present conditions, could furnish water for Darwen. Whether or when the Broadhead reservoir was made would depend entirely upon the development of Bolton. What might happen was purely a matter of speculation. In any case, Broadhead was not to be utilized for the purposes of Darwen. The drainage area of the Entwistle reservoir during the period of three consecutive minimum dry years was 3,850,869 gallons a day. Had the Cadshaw reservoir been built, it would not have increased the yield of the drainage area, but it would have acted as an excess storage tank. The only difficulty was whether it would not have cost a great deal more than it was worth, if it had been constructed merely as a storage tank. This was the whole case. For what it would have actually cost, it would not have paid Bolton to construct it. If, however, it had been constructed as a storage tank for Bolton, it would have enabled a supply to have been given to Darwen at a very cheap cost. He handed in a table showing the total capital cost of the Entwistle and Wayoh reservoirs and works to have been £368,022; and the annual charges (with interest at 3½ per cent.), £14,759. This sum, divided by the available quantity of water—1,449,052,920 gallons a year, or 3,970,008 gallons a day—with cost of filtration, &c., and management, made the total cost per 1000 gallons 5 762d. He, however, considered that the Corporation of Bolton had been obliged to modify their plans in consequence of the unforeseen difficulties that arose with regard to Cadshaw; and he accepted this as imposing a further obligation upon Darwen. The proper method of dealing with the matter was to take the Entwistle system in conjunction with the Delph, and average the two. This gave a total capital cost of £740,178, with annual charges at £28,342. This sum, divided by the total quantity of water that would be available—2,081,056,990 gallons a year—made 6·086d. per 1000 gallons. Adding to this the figure agreed upon, of 0·5d. for management, he arrived at a total cost of 6·586d. per 1000 gallons. This was a figure he would allow if there was an agreement between the parties; and on the items enumerated he did not think it was material whether the supply was an obligation or not. If the proportion of the cost of the Act (£1841) were included, this would add 0·007d. per 1000 gallons, which made the total 6·593d. This was a fair and reasonable cost, such as ought to be made to Darwen by Bolton. The figure of 12½ per cent. for contingencies, &c., taken by the other side was very high, and half as much would be ample for the purpose contemplated. Mr. Terrey had referred to the great increase in cost of works. This gentleman had in his mind at the time, quite properly, the fact that he was not buying a great deal of plant and material for reservoirs which Sheffield were making in one of their own valleys, which they had had power to make for very many years; and he found an enormous increase in the cost of this kind of thing. He said 40 or 60 per cent. This was true. But it was for plant; it was not the reservoir. There was an increase in wages, too, but not of 40 or 60 per cent. The great difference in the cost of reservoirs now as compared with sixty or eighty years ago, was that in the old time they were made with their banks of earthwork, and the masonry about them was of a rougher kind, and there was less of it. Though heavy, it was simple. Nowadays they put a very high class of work in. In the old type of reservoir they put puddle in connection with their work which would make him (witness) tremble if he put it in reservoirs to-day. Darwen was in no sense a partner in this scheme; it was simply a purchaser of water.

Cross-examined by Mr. BALFOUR BROWNE, witness said he had prepared a table, on the lines of his other ones, referring to the Delph scheme alone; and this brought out a total cost per 1000 gallons of

8·476d. He considered the 0·5d. allowed for management was ample to include such contingencies as might arise.

Mr. SUTTON, addressing the Arbitrator, said the matter was one of great importance; but he was sure there was nothing to be found in the proceedings which suggested for a moment that there was a partnership between the parties. On the contrary, it was perfectly clear that it was to be a case of vendor and purchaser. It was admitted that, if Bolton had built the Cadshaw reservoir as originally intended, Darwen would have had a very cheap supply, of which they had been deprived by the alteration in the plans. He did not contest that this was a misfortune which fell upon both of them; but was it to be tolerated that, when Darwen had been deprived of what would have been an exceptionally cheap supply, because Bolton had made errors in their estimates in Parliament, and made great mistakes, they should use these facts as a fulcrum by which they should be enabled to shift upon Darwen a contribution to the cost of the whole of the new waterworks? From the lower reservoirs it was admitted, as an engineering fact, that Darwen would receive nothing. The only reservoirs which would contribute to their supply were Entwistle, Wayoh, and Delph. The way Mr. Eaton had dealt with the matter was extremely fair; and it brought out the cost of the water to 6·586d. per 1000 gallons.

Mr. BALFOUR BROWNE, in reply, said the question to be decided was the basis on which the cost of the water to the seller was to be ascertoined. He had never claimed that the parties were partners, but only so in a sense. They were both participating in the benefits of the water scheme of 1905. This was the only partnership. It was obvious that the Act would never have used the word "price" between partners; and he never suggested it. The matter had not for an instant been put by Bolton on a partnership basis. The whole of the works embraced by the Act of 1905 constituted one scheme; and the Arbitrator had not only to look to the expense to-day, but to the outlay on the whole scheme up to 1939. This was what Darwen were participators in. They were not charging them with anything that was entirely for the benefit of Bolton. It was a relief scheme for Bolton, and in this relief scheme Darwen were to be participators, and to have the benefit of 300,000 gallons of water per day, at a price. As to the figures, the Arbitrator must come to the conclusion that something should be allowed for management, and that there would also be a reserve fund which should go into the cost of water. It was provided by the Act. It was the way in which Bolton's revenue was to be disposed of before any reduction in the price of water was made. It was absurd to say that a reserve fund was profit. The whole idea of a reserve fund was, not that it should be profit, but that it should be available to meet any extraordinary claim, or a deficiency in income. With very proper moderation, Bolton had not asked for a profit, but simply for indemnification. But it was the duty of the Arbitrator to see that they got complete indemnification, not merely for the price of water to-day, but for the price of water for all the reservoirs that would have to be made in future, because they would have to go on supplying Darwen when Delph was no longer able to supply Bolton.

This concluded the proceedings; the Arbitrator reserving his award.

BIRKENHEAD AREA EXTENSION SCHEME.

A Local Government Board inquiry was opened last Wednesday by Mr. Shelford Bidwell regarding an application by the Corporation of the County Borough of Birkenhead for a Provisional Order to take into their jurisdiction seven new districts—Bromborough, Higher Bebington, Lower Bebington, Storeton, Prenton, Noctorum, and a part of Bidston. All the districts opposed the application; the Counsel briefed on the inquiry numbering about twenty-five.

Mr. Honoratus Lloyd, K.C., opened the case for Birkenhead, and said that great industrial developments were taking place in the district. The time had now arrived when Birkenhead could not go on spending capital for the benefit of these other districts, with the risk that another municipal authority might some day be set up at their doors. Gas was supplied by Birkenhead to every one of the outside areas excepting Storeton, an agricultural district which could be supplied as soon as the demand arose. At present the outside districts obtained their water supply from the local wells of the Wirral and West Cheshire Water Company. From time to time it was suggested that these wells could not go on for ever; but if the time ever arrived when a further supply was required, it could be afforded out of the magnificent supply which Birkenhead would soon be receiving from Wales. The Corporation supplied electricity to Bidston, Noctorum, and Prenton, and were willing to supply the other districts, as well as give improved means of communication. The sewerage and boundaries arrangements were very unsatisfactory; and the borough provided baths, markets, and slaughterhouses, which were of the greatest use to the outside inhabitants. This was no policy of grasp on the part of the Corporation. They were moved simply by a desire to act fairly, so as to secure the welfare of all by the establishment of a uniform and strong authority. They had been willing to discuss the question, and arrange details with the out-districts; but the representatives of the latter had preferred to fight on the principle. Speaking of the Birkenhead Welsh water scheme, he said that undoubtedly it would raise the Birkenhead rates; and the Council had power to increase the present water-rate from 1s. to 2s. 6d. in the pound. But they were prepared to agree that no burden in the way of a deficit on the water scheme should fall on the outside areas unless and until the water consumers had been charged the full 2s. 6d. in the pound.

The first witness was Mr. Godfrey A. Solly (the Chairman of the Parliamentary Committee); and he was cross-examined by Mr. Balfour Browne, with the idea of showing that the out-districts are more cheaply governed by the existing Councils than they would be by the Corporation.

Among other local bodies, the Waterloo-with-Seaforth Urban District Council have unanimously decided to oppose the Liverpool United Gaslight Company's Bill.

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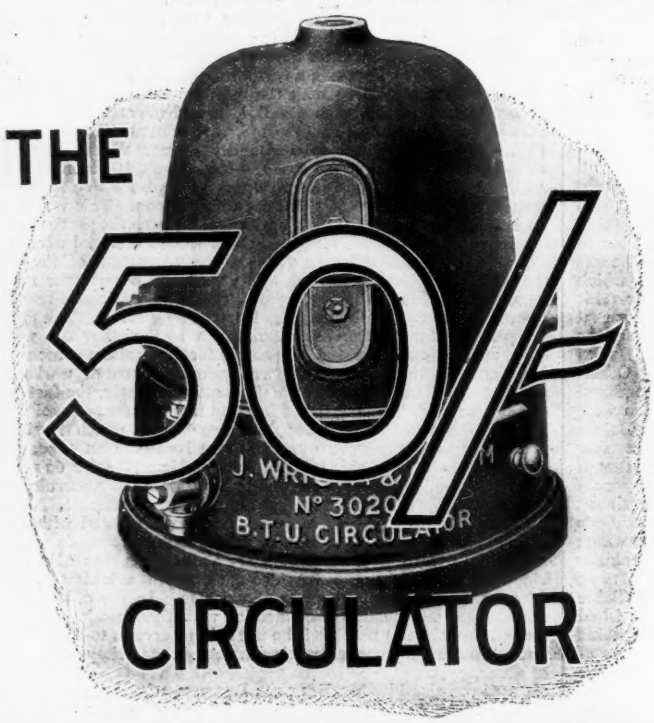

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NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

The remarks made in this column a few weeks ago have evidently perturbed the Convener of the Lighting Committee at Macduff. It would seem, however, that he has not the requisite knowledge of the electric terms and measurements, and so cannot follow the simple comparison between the cost of gas and electricity which was given. This gentleman omits a few words from the remarks, which explains the difference between my estimate and that of a contemporary. I took the efficiency claimed by the electricians—namely, one watt per candle—but mentioned that a larger amount of electricity per candle would be more correct. Mr. Morrison does not mention this in his letter, but proceeds to show that, because the estimates of the two gas papers differ, "it is unfortunate and a little disconcerting." He states that his facts will be brought before the public at the proper time, and then gives a number of towns where electricity is in use and a few where dividends are paid. Surely if the figures which Mr. Morrison could give would prove that those stated by me are wrong, this is the time for him to give them. He should ask his electrical friends how many of the electric street lamps have been removed in London streets, to make place for the high-pressure gas-lamps now in use—and these in the principal streets of that great city. The best advice that can be given to the people of Macduff is that they should allow an electrical firm to instal and work an electric lighting plant in their town, and let them make what profit they can out of the venture—that is, if they can find any firm willing to invest money in such a project.

Edzell is shortly to be lighted by the Brechin Gas Company. At a meeting of the Edzell Gaslight Company, Limited, called to consider proposals by the Directors, the shareholders agreed unanimously to accept the terms offered by the Brechin Company. The latter Company will take over the Edzell concern, and issue £1 guaranteed 3 per cent. preference shares for the £1 ordinary shares of the Edzell Company. These shares will rank *pari passu* with the 5 per cent. preference shares which the Brechin Company now have. Ratification of these proposals will now be required by the Brechin shareholders.

Dundee has a somewhat unenviable notoriety for the number of damages to, and thefts from, slot meters. Two mill workers, of 16 and 17 years of age, have 21 and 18 charges respectively against them for this offence; and they have been sent to the Borstal Institute.

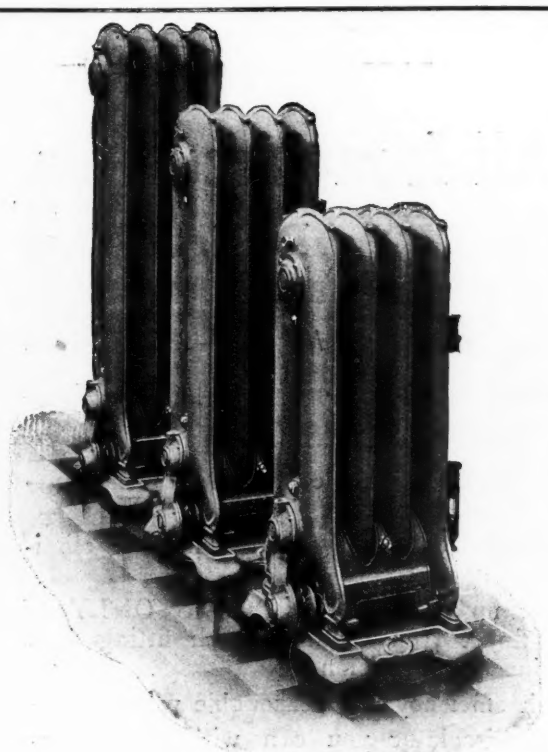
Rothesay has finally decided upon having an installation of vertical retorts on the Glover-West system; and West's Gas Improvement Company have obtained the contract, at a cost of £9825. At the same time, a new gasholder is to be erected, costing £7857, to be made by Messrs. Clayton, Son, and Co., Limited.

The Hamilton Town Council have finally decided to include their gas-works among those where vertical retorts are to be installed, and are making provision for carrying out the entire make of gas with such retorts, and in course of time scrapping the present horizontal system. For this purpose they have decided to obtain a complete plant capable of manufacturing 1,500,000 cubic feet of gas per day, and have accepted the tender of the Woodall-Duckham Company for the whole installation, which includes conveyors for handling coal and coke, and a belt-driven lift, &c., for which the total estimated cost is £21,265. The adoption of a vertical retort system in gas-works of this size can be clearly shown to be a paying scheme, as elevating and other machinery can be kept more or less constantly at work, and the amount expended upon it will earn a good return. In smaller places, however, such as Irvine, where the Gas Company only manufacture a little over 41,000,000 cubic feet of gas, but have also decided upon an installation of vertical retorts on the same system, this machinery will not be so frequently in use, and consequently the saving in the smaller installation could not possibly be so great.

At the meeting of the Keith Town Council, the question of the introduction of electric light into the town was mooted, but a counter-proposition was made so that this should also include the question of the purchase of the gas-works. The motion was agreed to.

It is understood that the Leven Gas Company have declined the offer of £8000 made by the Buckhaven Burgh for the pipes and supply rights of the Company in Methil and Innerleven.

Mr. W. E. M. Maxwell, the Burgh Chamberlain of Kirkcaldy, has reported to the Town Council upon the proposed schemes for the extension or rebuilding of the gas-works on a new site. He first refers to the financial position in 1911-12, when there was a surplus of £2136, but at which time no redemption was payable. This will in future absorb £3624 10s. yearly. In 1912-13, the surplus was only £154, and again no depreciation or redemption. For this year there is an estimated deficit of over £300, despite an increase of 2d. per 1000 cubic feet in the price of gas. Regarding the scheme for extension on the old site, for which the cost has been put at £46 800 by Mr. Kincaid, this shows a surplus profit, after paying interest and redemption, of £1450, or 2·67d. per 1000 cubic feet. It is proposed that the work, and consequently the cost of it, shall be spread over a period of four years. Mr. Herring considers that the cost of the work will be somewhat less than Mr. Kincaid's estimate—namely, only £45,000; and the revenue over £1000 more than that shown by the Manager. This would mean 5d. per 1000 cubic feet, as against the 2·67d. already mentioned. The first items to be looked into are the purifiers, at a cost of £6220, which is estimated to save £440, and increased accommodation for storing coke, which will save £240. These alterations are thus expected to bring in a clear surplus, after allowing for redemption, of £305. Turning to the matter of the new works on a new site, Mr. Maxwell sums this up in the words—"so that £1000 a year is the loss against the new works as compared with the reconstructed works." The conclusions come to are: That a substantial part of the present debt must be repaid before there can be any question of an entirely new works; that improvements at the present works should be introduced gradually; that a depreciation and renewals fund be formed and added to as it can be afforded, but that a minimum sum be included in the yearly estimates.



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CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

There has been much activity in the tar products market during the past week. Pitch has been in constant demand, and good business has been done at 39s. 6d. The same remark applies to ordinary London creosote, which is unobtainable under 3¾d. net. Liquid creosote is at the same level; but it is stated that there are one or two cheap sellers of this quality. Ninety per cent. benzol, toluol, and 90-160 solvent naphtha remain at the same level. There are buyers of 60° crude carbolic acid at from 1s. 1d. to 1s. 1½d., but makers will not accept the price.

Twenty-five per cent. good grey sulphate of ammonia has several times been sold at £12 in the period, and the price is maintained.

Tar and Tar Products in the Provinces.

The average values during the week were: Tar, 26s. 9d. to 30s. 9d. Pitch, east coast, 38s. 6d. to 39s.; west coast, Manchester, 37s. 6d. to 38s.; Liverpool, 38s. 6d. to 39s.; Clyde, 38s. to 39s. Benzol, 90 per cent., naked, North, 11¼d. to 1s.; 50 90 per cent., naked, North, 11d. Toluol, naked, North, 10¾d. to 11d. Crude naphtha, in bulk, North, 5d. to 5¼d. Solvent naphtha, naked, North, 9¼d. to 9¾d. f.o.b. Heavy naphtha, naked, North, 9d. to 9¼d. f.o.b. Creosote, in bulk, North, 3d. to 3¼d. Heavy oils, in bulk, 3⅝d. to 4d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 0¼d. to 1s. 1d. Naphthalene, £4 10s. to £10; salts, 55s. to 60s., bags included. Anthracene, "A" quality, 1½d. to 1¾d.; "B," nominally ¾d. per unit, packages included and delivered.

Sulphate of Ammonia Prices in the Provinces.

LIVERPOOL, *Feb.* 14.

During the past week the upward movement in the values of this material has continued, and the parcels offered for sale have been readily taken up. The demand for home consumption has not been large, but the requirements for export have been ample to absorb current production. The closing quotations are £12 10s. per ton f.o.b. Hull, £12 11s. 3d. per ton f.o.b. Liverpool, and £12 12s. 6d. per ton f.o.b. Leith. Little actual business has transpired in the forward position, although there have been inquiries from buyers abroad, and makers are willing to sell for July-December delivery at a discount off prompt prices.

Nitrate of Soda.

The market for this article is somewhat firmer, and spot quotations have been raised to 10s. 6d. and 10s. 9d. per cwt. for ordinary and refined quality respectively.

From another source it is reported that there has been a change for the better in sulphate of ammonia, and prices have risen to the extent of 2s. 6d. to 3s. 6d. per ton. Outside London, makes have been sold at £11 12s. 6d.; Leith, £12 10s.; Liverpool, £12 7s. 6d. to £12 8s. 9d.; Hull, £12s. 6s. 3d. to £12 7s. 6d.; Middlesbrough, £12 6s. 3d. to £12 7s. 6d.

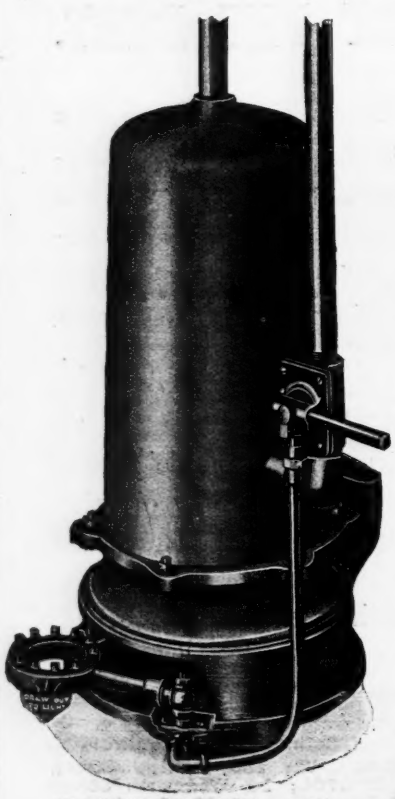
COAL TRADE REPORTS.

Northern Coal Trade.

The northern coal trade is steady for best kinds, but easier for secondary sorts. In the steam coal trade, best Northumbrian steams are from 13s. 8d. to 14s. 3d. per ton f.o.b.; second-class are about 11s. 10d. per ton; and steam smalls are from 6s. to 7s. 9d. per ton f.o.b. Production is fully maintained; and on the whole coals are well taken up, when it is remembered that this is the quiet season for steam coal shipments. In the gas coal trade, the rumours of German competition seem to have eased the market. For best Durham coals about 13s. 6d. per ton f.o.b. is the current quotation for early delivery; for second-class gas coals 11s. 9d. per ton is near the price; while for "Wear specials" about 15s. 6d. per ton f.o.b. is named. Shipments of gas coals are fair, but are now slightly declining. As to contracts, the rumours of German coals being bought for the Metropolis gather consistency; and it is said that some 250,000 tons of Westphalian coal have been bought for one of the great London Companies. Nothing is known as to the price; but the lowness of the sea freights is one of the factors, though this applies measurably to the coal sent coastwise from Durham. There will still remain very large quantities of gas coal to be bought in addition to any to be contracted for in Germany. Coke is steady. For good gas coke, about 13s. 6d. per ton f.o.b. may be quoted for shipment in the Tyne.

Porthcawl Gas Purchase Poll.—A poll has been taken of the ratepayers on the proposal of the Porthcawl Urban District Council to promote a Bill for the purchase of the local gas-works; and there was a majority of votes in favour of the measure. The figures were: For the purchase, 339; against, 206; majority for, 133.

Llanidloes Town Council and the Gas-Works.—The Llanidloes Town Council have resolved, and the ratepayers in public meeting have approved of the resolve, to purchase the undertaking of the local Gas Company for £2377, and that of the Electric Lighting Company for £400. The purchase is, of course, subject to the sanction of the Local Government Board; and both agreements are to be regarded as one inseparable transaction. A dispute about an increased charge for public lighting led last September to the streets being left in darkness for three weeks, during which period some of the leading councillors floated an Electric Lighting Company; and "immediately, without any orders from the Town Council, the Gas Company lit the street-lamps." The Electricity Company, however, obtained the contract to light the streets for seven years; and then the Gas Company approached the Council with an offer to sell.



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Street Lighting at Oldham.

At the last meeting of the Oldham Town Council, Mr. Hardman urged that the Lighting Committee be requested to consider the advisability of adopting electricity more extensively for street lighting. During the last ten years, he said, there had only been an increase of seven electric lamps in the streets, while 1050 gas-lamps had been added. It might be thought that electric lighting would be more expensive; but he would like to refer members to the lighting experiments in Portland Street, Manchester, where independent experts had reported that, both for efficiency and in regard to cost, the result was in favour of electricity. The suggestion found several supporters, after which the Mayor (Alderman Wilde, who is also Chairman of the Gas Committee) said if Mr. Hardman was prepared to stand or fall by Portland Street, and allow him to stand by Trafalgar Square, London, he (the Mayor) was prepared to agree to the test. If Mr. Hardman meant to extend the idea to the smaller lamps he (Alderman Wilde) was prepared to state that gas was better and cheaper for these. Mr. Coates observed that the matter had not been overlooked on the tours of the Lighting Committee. They must remember that until recently electricity had been practically prohibited for street illumination, because previous to the last Parliamentary Bill the town was lighted by gas free of charge. Mr. Hardman denied that he had any animosity towards gas. The Mayor: You began with a comparison about Portland Street, Manchester. You may have read your electricity papers, but I have read my gas papers.

Mossley Gas Undertaking Amalgamation Proposals.—It is stated that a deal is being negotiated between the Mossley Corporation and the Saddleworth Urban District Council for amalgamation proposals in regard to the Mossley gas undertaking. At the present time the price of Mossley gas in Saddleworth is 2d. per 1000 cubic feet more than in Mossley. In order to meet the Saddleworth Council's objection to this differential price, Mossley has now agreed to offer terms of partnership; and if these proposals are carried out, the 2d. difference will be abolished. Saddleworth will, it is expected, accept the proposed terms.

Oldham and the British Commercial Gas Association.—Objections were raised at the last meeting of the Oldham Town Council to the payment of £194 12s. 6d. to the British Commercial Gas Association. The amount was objected to, not the principle; one of the objectors stating that he did not think Oldham got an adequate return for the money. The Gas Committee should pay a fair contribution, but not too much. Local advertising, he said, would be better than national—at any rate, so far as Oldham was concerned. As an amendment, he moved that the subscription from Oldham be 1s. per million cubic feet. Alderman Wilde (the Chairman of the Gas Committee) held that the subscription was at the proper rate. He did not care, as it were, to pay 12s. 6d. for membership of a club when other members paid 21s. This reply found cordial support, and the amendment was defeated.

The Science of Gas-Stove Construction and Use.

Under the auspices of the North of England Gas Managers' Association a series of lectures commenced last week at Newcastle, Sunderland, Stockton-on-Tees, and South Shields. They were delivered by Mr. Harold Hartley, M.Sc., the Chief Chemist of the Richmond Gas Stove and Meter Company, to the officials of the various gas undertakings and to the master plumbers and others in the district. The lecturer dealt with the subject of combustion and the phenomena of heat as applied to the warming of workshops and domestic dwellings—discussing the requirements necessary from the hygienic standpoint, with especial reference to ventilation. He concluded with an analysis of the functions of the various parts of a modern gas-fire. The lectures were attended by large and appreciative audiences; and exceptional interest was taken in the "Richmond" new silent gas and air adjuster for gas-fires, the details and action of which Mr. Hartley described. One of the Company's "Period" series of gas-fires was shown in operation, absolutely free from noise, which served to convince those present as to the efficiency of the new fitting introduced by the firm at the beginning of the present season.

Some Disadvantages of Electric Lighting.

A proposal is on foot for providing Cranbrook with an overhead electric lighting scheme; the promoters being a Westminster firm, whose representative recently attended to explain the matter at a public meeting. Any idea of antagonism to the Gas Company was disclaimed; it being stated that there was room for both forms of lighting. Two conditions were, however, it was said, absolutely necessary—local support and overhead wires. The proposed price is 7d. per unit, with free service connections to 60 feet of the main; cottages to be charged per week, being wired and fitted with one lamp free. A number of questions were asked; and in the course of the proceedings, Mr. W. M. Mason, the Secretary of the British Commercial Gas Association, asked permission to say a few words. He pointed out that there were two sides to the question, and three points to consider—First, the simplicity of the rural districts, which were spoilt by overhead wires; secondly, cost (gas at 3s. 8d. per 1000 cubic feet being cheaper by three times than electricity at 6d. per unit); and, thirdly, unreliability (the London County Council refusing to sanction electricity for public buildings unless a duplicate system of lighting was provided). As to fire risk, he quoted the London Fire Brigade returns, showing one fire to every 3352 users of gas, to one fire to every 900 users of electricity. A resolution favouring the scheme was carried by a large majority; a demand for a poll failing to receive the requisite support.

Sale of Bury St. Edmunds Gas Shares.—At a local auction sale, fourteen £10 shares of the 1849 capital in the Bury St. Edmunds Gas Company were sold at £21 12s. 6d. each; and 59 £10 shares of the 1859 capital, at from £16 5s. to £16 10s. per share.

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From "The Times" of Feb. 11, 1814.

Just published.

A STATEMENT of the ADVANTAGES to be Derived from the INTRODUCTION of COAL GAS into FACTORIES, PUBLIC BUILDINGS, and DWELLING HOUSES, as a Substitute for the Lights now in use, with Observations on the Method of making and using it. By JOHN MAIBEN and Co., Perth; and sold by Thomas Underwood, 32, Fleet Street, London; A. Constable and Son, Edinburgh; John Lawson, 35, King Street, Snow Hill, Agent to the Patentee; and the principal booksellers in the United Kingdom.

Nottingham and the Derwent Water.

If the troubles which have arisen since the inception of the Derwent Valley water scheme had been limited to financial questions, they would have been sufficiently serious; but in relation to one of the areas served there is another matter which is occasioning increasing anxiety. Oft-repeated complaints as to the quality, and even the purity, of the water have broken out afresh in Nottingham. The Chairman of the local Committee has been responsible for the assurance, publicly given, that the water is absolutely beyond suspicion; but those who live in the particular quarters of the city to which the doubtful privilege of the supply has been extended appear to remain extremely sceptical. Officially, the suggestion that the water is disagreeable is condemned as being entirely unfounded. Indeed, it is claimed to be purer than Nottingham water itself. In his latest reference to the subject, the Chairman has, however, admitted that much of the Derwent output now finding its way into Nottingham houses is "very unsatisfactory." He accounts for this, however, by the explanation that, owing to the Derbyshire supply being turned on to a larger area, the sediment and deposit in the pipes are being disturbed. The exercise of a little patience is asked for; but the general condemnation of the character of the water on the part of the majority of consumers seems to indicate that patience has been exhausted. Indeed, the question has been seriously raised in Nottingham whether the water as at present supplied is not absolutely baneful to public health; and the feeling in favour of an independent and searching scientific inquiry into the matter is daily becoming accentuated.

Minimum Wage at Oldbury.—During a discussion at the Oldbury Council meeting recently, on a motion to fix the minimum wage of able-bodied men at the gas-works at 23s. per week, Mr. C. Tomlinson (the Chairman of the Gas Committee) said some twelve months ago the Gas Committee had under consideration the question of the men's wages; and they gave them advances. There were now only two very old men on the ground who were receiving less than £1 per week. The retort men were receiving 5s. 9d. per day. The Council unanimously agreed to the 23s. minimum for able-bodied gas workers.

Gas and Electricity Prices at Carlisle.—In accordance with notice of motion, Mr. Gibbings proposed at last Tuesday's meeting of the Carlisle City Council that a variation be made in the resolution adopted at the previous meeting relating to the prices of gas and electricity, ordering that whenever the Gas and Electricity Committees were requested to quote prices other than those already fixed by the Committees concerned for lighting or power to consumers of either gas or electricity, the Engineers, and, if necessary, the Committees, shall confer before any quotation is made, with a view to preventing unnecessary competition and cutting of prices. He said that the resolution on the subject was absurd. The motion was agreed to.

Failure of the Electric Light at a Wedding Supper.—"Everything," says the "Electrical Times," "did not pass off like the proverbial marriage bell on the day on which the daughter of Mr. Henry Nathan, of Stamford Hill, entered the bonds of holy matrimony. Fortunately the happy pair were not concerned. Mr. Nathan had arranged for a ball in the evening, and had hired a band; the proceedings being timed to end about 3 or 4 a.m. Messrs. Piggott Bros., of Bishopsgate, supplied various accessories for the festivities, including extra electric lighting. The guests sat down to supper in a marquee at 11.40 p.m., but at this critical hour the lights failed. Only two candles were in the house; and as these did not altogether supply adequate illumination, the ball had to end prematurely. As a result of this evening, Piggott Bros. claimed £23 16s. 6d. from Mr. Nathan, who counterclaimed £20 for 'loss of society of guests.' It would be interesting to know the number of guests present, so that we might be in a position to determine the value of a guest's society per hour. It was urged on behalf of the plaintiffs that Mr. Nathan had been warned that the additional load might prove the straw that broke the camel's back. Judge Atherley Jones allowed both claims, and gave judgment accordingly."

Hull Corporation Water-Works Profits.—At their last week's meeting, the Hull Corporation Water and Gas Committee decided to devote to the relief of the rates the sum of £15,000 out of the profits of the undertaking for the past year. The Chairman (Alderman Feldman) stated that the gross estimated income for the past year was £69,770; the working expenses, £32,159; interest on sinking fund, &c., £17,330; and the net profit, £20,281: the surplus, after allowing for capital expenditure of £1925, was £18,356; and the reserve fund on March 31 last year amounted to £8741. The Committee recommended a grant of £15,000 towards the relief of the rates—the same as last year; and further that the balance of the cost of the land at Dunswell, £2200, should be paid, and the remainder, about £1150, transferred to the reserve fund. This, the Chairman said, would make the reserve fund nearly £10,000—the maximum. As an amendment, Mr. Lofthouse moved that the £15,000 be given to the consumers in a reduction of the water-rate—pointing out that they had done this in connection with the electric light undertaking. The Chairman replied that they were committed to a large expenditure in connection with the new works at Dunswell; and if they now reduced the rate they would afterwards have to increase it. The amendment was defeated.

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A Lower Price at Ilkley.—The Ilkley Urban District Council have determined to reduce the price of gas to 2s. 10d. per 1000 cubic feet; the change to apply as from April 1 next.

Tuam Gas-Works.—In regard to his taking over of the Tuam Gas-Works, Mr. T. J. Reid announces that gas suitable only for incandescent lighting and heating will be supplied. A reduction of 7d. per 1000 cubic feet is now in operation.

Ideal Home and Gas Exhibition at Tunbridge Wells.—An ideal home and gas exhibition recently held in the Sussex Assembly Room, Tunbridge Wells, by a local firm (Messrs. W. G. Harris and Co., Limited), with the co-operation of the Tunbridge Wells Gas Company and other firms, was very attractive. It was opened by Alderman W. H. Delves, the Chairman of the Company, who remarked that the exhibition was a useful object-lesson to all concerned with the conduct of the home, and would be of special interest to those who had to study domestic economy. A model house was the means of illustrating the capabilities of gas for lighting and heating purposes. The Company also made a comprehensive display of modern labour-saving gas appliances; and under their auspices cookery lectures were given in the Corn Exchange by Miss Florence Surridge.

Electricity Extensions and Existing Gas-Mains.—An important point was raised by Mr. Buck at last week's meeting of the Carlisle City Council, in connection with a proposal of the Electricity Committee to extend the electric cable to Scotby, at a cost of £490. Mr. Buck said that considerable capital had been expended in laying gas-mains to Scotby and Wetheral; and to encourage the consumption, the price had recently been reduced to 2s. 6d. per 1000 cubic feet. If the proposal was agreed to, the Corporation would be exploited on behalf of the well-to-do residents in outlying villages, to the detriment of capital already expended. The loans so far obtained and applied for, and in contemplation, for the Electricity Department would become ere long a great burden on the finances of the city. Mr. Gibbings replied that the policy advocated by Mr. Buck was a "dog-in-the-manger" one; and the Committee's recommendation was then agreed to.

The Dangerous Chandelier Again.—At an early hour last Friday morning, a serious gas explosion occurred at Canbury Lodge, Kingston-on-Thames, by which two persons were injured and very considerable damage was done to the premises. On the previous evening the occupants went to a dramatic performance, leaving an old-fashioned chandelier lighted in the dining-room. When the party returned, two of them – a Mrs. Lambert, a widow, and Mr. Lambert, her son—who were staying in the house, went into the dining-room, where the gas was still alight. As soon as they opened the door there was a loud explosion, and the room was filled with flames. Mr. and Mrs. Lambert were thrown against the wall, and burnt about the face and hands. The whole of the north side of the house was practically reduced to a heap of ruins. The firemen found the roof hanging over the *débris*, and it had to be pulled down with ropes.

Dessau Verticals for Morley.—At the last meeting of the Morley Town Council, it was decided to instal Dessau vertical retorts in place of the present system. The provision of the new retorts will involve an outlay of £12,000; but it is estimated that there will be a saving of £1000 a year as compared with the present charges.

London County Council and Testing High-Pressure Gas-Meters.—At the meeting of the London County Council to-day, they will consider and decide, as required by the Borough Funds Act, 1872, as to passing resolutions confirming the propriety of the promotion by the Council this session of legislation dealing (*inter alia*) with the testing of high-pressure gas-meters for use in the County of London.

Queenstown Water Supply.—Mr. P. C. Cowan, Chief Engineering Inspector to the Irish Local Government Board, has held an inquiry in Queenstown into the application of the Urban District Council for sanction to a loan of £10,000 to provide a duplicate main from Tibbotstown to Queenstown in connection with the water-works. When informed that it was proposed to spread the loan over fifty years, the Inspector said this was most unusual; the period for such water-works as they had at Queenstown being, as a rule, thirty years.

St. Petersburg Water Supply.—The Russian Supplement to "The Times" yesterday contained the following particulars on the subject of the water supply of St. Petersburg: "The long-delayed project of providing pure water for St. Petersburg appears to have made some slight headway. It was unanimously decided by the City Council at a recent sitting that the source of the future supply must be Lake Ladoga, and that the water should be taken some distance from the shore and brought down to the city—a distance of 40 miles—in covered pipes. . . . The cost of the work is estimated at R.47,590,000 (£5,000,000). It was decided to assign R 3,018,000 for preliminary work this year. On reaching the Ladoga pumping-station the water will be driven into reservoirs and filters, whence it will flow through the pipes unaided to the capital and be there distributed. The capacity of the works, which will be ready in 1920, is calculated for a population of 4½ million."

Electric Light Failure at Tunbridge Wells.—Last Friday week considerable consternation was caused in Tunbridge Wells by the sudden failure of the electric light shortly after eight o'clock. The lights were out for nearly an hour in all. The whole of Grove Hill Road and its immediate environs were suddenly plunged into darkness—with the usual unfortunate results. It is reported that the cause of the failure was that one of the high-tension trunk mains supplying electricity to the locality involved had been damaged inadvertently by somebody driving a pick into it. The action was evidently quite unconscious on the part of the wielder of the pick, a local paper says, as no notification of the mishap was given to head-quarters. Consequently, the first apprisal of the trouble that the department had was the failure of the lights; and "it speaks volumes for the enterprise and organization of the department that they were able to repair so serious a damage within an hour."

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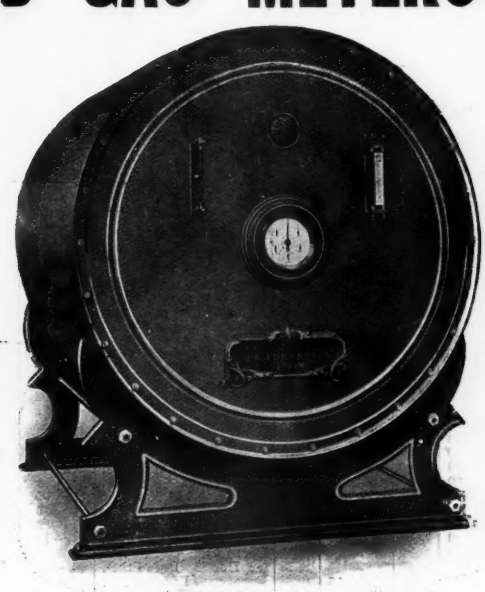

No. 245. Braddock's Large Wet Meter.

J. & J. BRADDOCK (BRANCH OF METERS LIMITED), Globe Meter Works, **OLDHAM,**

Telegrams: "BRADDOCK, OLDHAM." National Telephone No. 815.

AND 45 & 47, WESTMINSTER BRIDGE ROAD, LONDON, S.E.

Telegrams: "METRIQUE, LONDON." Telephone No. 2412 HOP.

"Manganesite" (the sole proprietors and manufacturers of which are Messrs. John Hudson and Co.'s Successors, of No. 4, Victoria Warehouses, Mansell Street, E.) is a jointing material for steam, water, gas, and air pipes, &c., of which particulars are given in a booklet that should prove of interest to those concerned in the making and maintenance of joints. That pipe-joints will never blow out is guaranteed to users of "Manganesite;" and it is claimed that after years have elapsed joints will be as tight as when they were first made. In addition to being non-poisonous, it is a preventative against rust; and it is also said to possess substantial advantages from the point of view of economy.

The Gas Committee of the Burton-on-Trent Town Council have decided to again appoint Mr. J. Ferguson Bell, of Derby, as Consulting Engineer to the gas-works for the year ending March 31, 1915, at the same remuneration as before—viz., £115. It was further recommended that a fee of £350 be paid to him for special work, comprising the completion of the retort-house, the removal and reconstruction of the condensing, exhausting, and ammonia recovery plant, and the removal and re-erection of the coal shed—the latter payment to be exclusive of draughtsmen's time and the taking out of quantities. The Local Government Board have sanctioned the proposal of the Council to borrow £13,000, of which £4500 will go towards the purchase of the Rolleston and Tutbury gas undertakings, £7020 for extensions of mains, and £1480 for a booster and pressure-regulators.

The new catalogue of Messrs. Curtis's and Harvey's gas-mantles appears to contain "something for everyone;" but even if just what is wanted should not be found it is of no importance, for the firm lay themselves out to make special mantles to customers' own specification of weight and quality. To these, of course, any names can be applied. A point is made of the fact that all the mantles supplied by them are entirely British made by British labour in their gas-mantle factory at Dartford. Woven inverted and upright mantles are manufactured on the firm's own patent machines, and are subjected to a special burning-off process which is claimed to give to them exceptional strength and durability.

The Richmond Gas Stove and Meter Company held their twenty-seventh half-yearly conference of representatives and heads of works departments at Warrington last week. The work of the half year was fully reviewed and future developments discussed. Mr. A. A. H. St. Leger, the Company's water-heater constructional expert, gave a comprehensive lecture dealing with the application of gas to the heating of water; and a thorough inspection was made of the wide range of apparatus the Company are manufacturing in this branch of their business. Particular attention was given to the "Ironclad" all-iron circulator which has created so favourable an impression since its introduction last year. The three days' conference concluded by those present being entertained to dinner by the Directors.

GAS COMPANIES IN THE STOCK EXCHANGE.

The Stock Exchange has had another interesting week, though less agitating than its predecessor. Appearances at first seemed to menace that the realizations to secure profits were growing almost too strong, and the fall in markets was going too far. But about mid-week some strengthening factors came to the front, and there was a sharp recovery, which was specially conspicuous in the most important markets. Thus Consols, which had given way somewhat, finished up with a total advance in the week of 1¼ upon the opening figures; and Rails, after one or two rather bad days, were elated by gratifying dividend announcements, and rose freely. The settlement of a rather heavy account tended to keep fresh business at low pressure. The opening day was quiet, but the tone was fairly satisfactory in most markets, though Government issues were not among them. Rails were inactive, but scored some rises before the close; and Transatlantics were rather better. Tuesday opened fair, but could not last. Continental realizations and other weakening influences depressed prices almost all round. Consols fell ¼ for the account, Rails receded, and Americans were lowered by local selling. Business was sluggish on Wednesday, and the general tone was dull. The gilt-edged division was weaker, though Consols managed to recover ¼. Rails lacked strength altogether, and the Foreign Market was dull. Americans were about the best. Thursday was cheered by a successful completion of the settlement. Government issues were stronger, and Consols rose ¼. In Rails there were irregular movements in various lines. The Foreign Market was fair. A very bright Friday succeeded, with markets all round quite cheerful and rising freely. Government issues were in fine form, and Consols rose ¾. Rails were buoyed up by good dividend results, and prices advanced materially. Transatlantics shared the popular favour, and Foreign showed strong points. Saturday was very quiet, but still cheerful. Consols were unchanged, closing at 77 to 77⅛. Rails did well, and Transatlantics were rather better. In the Money Market there was an abundant supply, and rates for short loans and for discount hardly moved. Business in the Gas Market was a good deal quieter, both in the aggregate and in individual issues, not even the big ones showing anything like an average array of transactions. But it did them no harm, for they presented more than an average of advanced quotations. In Gaslight and Coke issues, the ordinary realized 105 to 106¼ *cum div.*, and 102½ to 103¼ *ex div.* In the secured issues, the maximum marked 77 and 77⅝ *cum div.*, the preference 99¾ and 99⅞ *cum div.*, and 96¾ to 98 *ex div.*, and the debenture 73¼. South Metropolitan fetched 113¼ and 114 *cum div.*, and 110¼ to 112 *ex div.* Commercials were not dealt in. Among the Suburban and Provincial group, Brentford old changed hands at 263, ditto preference at 111½, British at 45½, South Suburban at 117⅞ to 118½ (a rise of ½), Tottenham "B" at 115 *ex div.*, Wandsworth "B" at 135 and 135½, and (on the local Exchange) Newcastle at 103—a rise of 1. In the Continental companies, Imperial marked 175 to 176¾, ditto debenture 84¾ *ex div.* (a rise of 1¾), Union 80 to 81½, ditto preference 119, and European 17⅝ to 18½. Among the undertakings of the remoter world, Monte Video realized 11⅞, Primitiva 6⅝ to 6 15/16, ditto preference 5 to 5 5/16, and ditto debenture 92½—a rise of 1.

OFFICIAL QUOTATIONS AT THE CLOSE OF THE WEEK.

Bank Rate (fixed January 29), 3 per cent. Last year, 5 per cent. Consols, 77—77½. Previous week, 75⅞—76¼.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 15	4	Alliance & Dublin Ord.	58—62	+2	6 9 0
374,000	,,	Jan. 15	4	Do. 4 p.c. Deb.	73—81	..	4 12 9
280,000	5	Oct. 15	7½	Bombay, Ltd.	6—6½	..	5 15 5
50,000	10	Aug. 28	16†	Bourne-mouth Gas and Water — 10 p.c.	28¼—29½	..	5 2 2
359,500	10	,,	7	B 7 p.c.	14½—15½	..	4 11 10
75,000	10	,,	6	Pref. 6 p.c.	13¼—13¾	..	4 7 3
380,000	Stk.	Aug. 14	14	Brentford Consolidated	263—268	..	5 4 6
330,000	,,	,,	11	Do. New	207—212	..	5 3 9
50,000	,,	,,	5	Do. 5 p.c. Pref.	111—113	..	4 8 6
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
217,380	Stk.	Aug. 28	11	Brighton & Hove Orig.	201—206	..	5 6 10
244,200	,,	,,	8	Do. A Ord. Stk.	149—152	..	5 5 3
530,000	20	Sept. 26	12½	British	44½—45½	..	5 9 3
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.	96—92	+5	4 7 0
245,771	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	89—91	..	4 7 11
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	2½—4½	..	—
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	73—78	..	5 15 5
157,150	Stk.	Aug. 14	5	Chester 5 p.c. Ord.	109—111	..	4 10 1
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	105½—107½*	..	5 1 7
560,000	,,	,,	5½	Do. 3½ p.c. do.	103½—105½*	..	5 1 1
475,000	,,	Dec. 11	8	Do. 3 p.c. Deb. Stk.	71—73	..	4 2 2
800,000	Stk.	,,	4½	Continental Union, Ltd.	79—82	..	5 9 9
200,000	,,	,,	7	Do. 7 p.c. Pref.	117—122	..	5 14 9
492,270	Stk.	—	7⅛	Derby Con. Stk.	123—125	..	4 12 0
55,000	,,	—	4	Do. Deb. Stk.	102—104	..	3 16 11
1,002,180	10	Jan. 15	10	European, Ltd.	17½—18½	..	5 8 1
16,386,660	Stk.	Feb. 12	4/17/4	Gas-light and Coke — 4 p.c. Ord.	102—104*	..	4 13 8
2,600,000	,,	,,	3½	3½ p.c. max.	74—77*	..	4 10 11
4,062,235	,,	,,	4	4 p.c. Con. Pref.	95—98*	..	4 1 8
4,674,850	,,	Dec. 11	5	Coke and 3 p.c. Con. Deb.	72½—74½	..	4 0 6
258,740	Stk.	Sept. 11	5	Hastings & St. L. 3½ p.c.	90—92	..	5 8 8
70,000	10	Oct. 15	11	Hongkong & China, Ltd.	16⅞—17½	..	6 7 6
131,000	Stk.	Sept. 11	7½	Ilford A and C	150—153	..	4 19 8
65,780	,,	,,	6½	Do. B	118—120	..	5 2 1
66,500	,,	Dec. 30	4	Do. 4 p.c. Deb.	89—91	..	4 7 11
4,940,000	Stk.	Nov. 13	9	Imperial Continental	174—179	..	5 0 7
1,235,000	Stk.	Feb. 12	8½	Do. 8½ p.c. Deb. Red.	83½—85½*	+1⅛	4 1 10
200,342	Stk.	Aug. 28	6¼	Lea Bridge Ord. 5 p.c.	118—121	..	5 3 4
561,000	Stk.	,,	10	Liverpool United A	210—212	..	4 14 4
718,100	,,	,,	7	Do. B	145—147	..	4 15 3
306,083	,,	Dec. 30	4	Do. Deb. Stk.	97—99	+2	4 0 10
63,480	Stk.	Dec. 30	3	Maidstone 3 p.c. Deb.	65—67	..	4 9 7
75,000	5	Dec. 11	6	Malta & Mediterranean Met. of Melbourne — 4½ p.c. Deb.	4⅜—4⅝	..	6 8 1
250,000	100	Oct. 1	4½		98—100	+1	4 10 0
541,920	20	Nov. 27	4	Monte Video, Ltd.	11¾—12½	..	6 10 8
1,775,892	Stk.	July 30	4½	Newc'tle&G'tesh'd Con.	102½—103½	+1	4 7 0
529,705	Stk.	Dec. 30	2½	Do. 3½ p.c. Deb.	£2—83	−½	4 4 4
55,940	10	Aug. 28	7/10,6	North Middlesex 7 p.c.	15½—13½	..	5 11 5
300 000	Stk.	Nov. 27	8	Oriental, Ltd.	120—125	..	6 8 0
60,000	5	Sept. 26	10	Ottoman, Ltd.	7⅞—8¼	..	6 3 1
60,000	50	Aug. 14	13	Portsea, Island B	120—133	..	4 17 9
100,000	50	,,	12	Do. C	120—123	..	4 17 7
249,980	5	Oct. 15	8	Primitiva Ord.	6½—7	..	5 14 4
499,960	5	Dec. 30	5	,, 5 p.c. Pref.	5—5½	..	4 15 3
521,600	100	Dec. 1	4	,, 4 p.c. Deb.	£3—95	+1	4 4 3
346,198	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	87—89	..	4 9 11
275,000	5	Sept. 26	12	San Paulo, Ltd.	—	..	—
150,000	10	,,	6	Do. 6 p.c. Pref.	10¾—11⅞	..	5 5 6
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	48—50	..	5 0 0
135,000	Stk.	Aug. 28	10	Sheffield A	223—225	..	4 8 11
209,984	,,	,,	10	Do. B	223—225	..	4 8 11
523,500	,,	,,	10	Do. C	222—224	..	4 9 3
90,000	10	Oct. 15	7½	South African	10½—11½	+½	6 10 5
6,429,895	Stk.	Feb. 12	5/9/4	South Met., 4 p.c. Ord.	110—112*	..	4 17 7
1,895,445	,,	Jan. 15	3	Do. 3 p.c. Deb.	73—75	+1	4 0 0
209,820	Stk.	Aug. 14	8½	South Shields Con. Stk.	159—161	..	5 5 7
952,795	Stk.	,,	6	S'th Suburb'n Ord. 5 p.c.	117—119	+½	5 0 10
60,000	,,	,,	5	Do. 5 p.c. Pref.	112—114	..	4 7 9
117,058	,,	Dec. 30	5	Do. 5 p.c. Deb. Stk.	113—115	..	4 6 11
594,740	Stk.	Nov. 13	5	Southampton Ord.	101—104	..	4 16 2
120,000	Stk.	Feb. 12	7⅞	Tottenham and District — A 5 p.c.	135—138*	+⅜	5 6 10
543,940	,,	,,	6⅝	B 3½ p.c.	114—116*	+⅛	5 1 3
149,470	,,	Dec. 30	4	4 p.c. Deb.	89—91	..	4 7 11
182,380	10	,,	5	Tuscan, Ltd.	5—6	..	8 6 8
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	95—97	..	5 3 1
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	111—113	..	4 8 6
30,000	Stk.	Aug. 28	8⅜	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	155—160	..	5 4 8
255,636	,,	,,	6¼	,, B 3½ p.c.	132—137	..	5 0 4
108,075	,,	,,	5/17/3	,, C 3½ p.c.	112—117	..	5 0 3
352,000	,,	,,	6½	Wimbledon 5 p.c.	111—116	..	5 5 7
98,000	,,	,,	6⅝	Epsom 5 p.c.	115—120	..	5 10 5
88,416	,,	Dec. 30	3	3 p.c. Deb. Stk.	70½—72½	+½	4 2 9

Prices marked * are "Ex Div." † Next Dividend will be at this rate.

The number of prepayment meters in Sleaford largely exceeded those of the ordinary type—806, compared with 644—at Dec. 31 last.

The Builth District Council contemplate buying the local gas-works; and the Directors of the Gas Company have made a definite offer to sell. Negotiations are now in progress.

A great amount of damage was caused by a fire last week in a building where there were stored an immense number of films, and the fire brigade, who had to work hard to confine the conflagration, incurred a considerable amount of risk from live electric wires. Several of the men, the "Yorkshire Observer" says, received shocks; and at one time four of them were momentarily "knocked out" together. Much doubt is expressed as to the origin of the fire, which was preceded by an explosion or explosions. In some quarters a gas heating apparatus is suspected; but with inflammable goods like films, it is difficult to definitely assign a cause.

We have received a copy of "Sell's Directory of Registered Telegraphic Addresses"—a useful addition to the office books of reference. It contains the name, telephone number, postal address, and full business particulars of each firm; and there is an alphabetical index. There is also a classification of trades for the whole country; about 100,000 British firms being arranged under 3000 separate headings, according to their respective occupations. Further, there is a representative list of firms in the Colonies and foreign countries. The volume fulfils an essential condition for works of this kind, inasmuch as it has been revised right up to date. It is published at No. 166, Fleet Street, E.C.

The Gas Committee reported at a meeting of the Walsall Town Council last week having had under consideration a communication from the Gas Engineer (Mr. B. W. Smith) stating that, in consequence of the high-pressure system of gas lighting becoming so popular with the tradesmen in the town, it is necessary to extend the plant. They have agreed with his suggestion that a new station should be erected at the Wolverhampton Street works.

Owing to the continued increase in the demand for gas in the district, the Directors of the Basingstoke Gas Company recently instructed their Manager, Mr. W. Higgs, to prepare plans and specifications for a new telescopic gasholder, of 300,000 cubic feet capacity, in a steel tank; and at their last meeting the Board of Directors of the Company accepted the tender of Messrs. Thomas Piggott and Co., Limited, of Birmingham, to at once carry out the work under the supervision of Mr. Higgs.

The desirability of the Corporation undertaking the provision of lighting facilities in courts and jetties at Coventry has been impressed upon the local authority from time to time. The Council referred the matter to the Watch Committee and the Gas Committee to see what arrangements could be made. Accordingly, the Watch Committee have decided to submit to the City Council at their next meeting a recommendation that lamps be provided in these places, at an annual cost of about £620. There is also an initial expense of £1167 for the provision of service-pipes, fittings, &c.; but this the Gas Committee have agreed to bear.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

ASSISTANT-ENGINEER. Cardiff Gaslight Company. Applications by March 2.
COAL REPRESENTATIVES. No. 5844.
DRAUGHTSMAN. Gibbons Bros., Ltd., Dudley.
REPRESENTATIVE. Sutherland Meter Company, Birmingham.
WASTE INSPECTOR. Woking Water and Gas Company. Applications by March 2.
SALESMAN. No. 5846. Applications by March 4.

Books Wanted.

CRIPPS' GUIDE-FRAMING OF GASHOLDERS. No. 5840.
HERRING'S GAS-WORKS CONSTRUCTION. W. Coward and Co., Ltd., 100, Bishopsgate, E.C.

Gas-Works Wanted.

"D. G.," c/o SCRIPPS'S, 13, South Molton Street W.

Plant, &c. (Second-Hand), for Sale.

REMINGTON TYPEWRITER. White, Arcade, Northampton.
RETORTS. Cork Gas Company.

Patent Licences, &c.

MANTLE MAKING MACHINERY, &c. Haseltine, Lake, and Co., 28, Southampton Buildings, W.C.

Company Meetings.

HARROW AND STANMORE GAS COMPANY. Holborn Restaurant. March 2. One o'clock.

Sales of Stocks and Shares.

ANNFIELD PLAIN AND DISTRICT GAS COMPANY. Tyne and Stanhope Railway Inn, Annfield Plain. Feb. 27.
BOURNEMOUTH GAS AND WATER COMPANY. London Mart. Feb. 24.
BROADSTAIRS GAS COMPANY. London Mart. March 3.
HARROW GAS COMPANY. London Mart. March 3.
SOUTH-WEST SUBURBAN WATER COMPANY. London MART. March 3.

TENDERS FOR

Condensers.

SHEFFIELD GAS COMPANY. Tenders by March 3.

General Stores (Oil, Lime, and Vitriol).

MIDDLETON CORPORATION. Tenders by March 10.

Lighting Goods.

CALCUTTA CORPORATION. Tenders by March 23.

Pipes.

MIDDLETON CORPORATION. Tenders by March 10.

Tar and Liquor.

HAWORTH URBAN DISTRICT COUNCIL. Tenders by Feb. 21.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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See Illustrated Advertisement, Feb. 10, p. 394.

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Telegrams: "Chemicals."

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Manufactured and Supplied by C. Bourne, West Moor Chemical Works, Killingworth, or through his Agents, F. J. Nicol & Co., Pilgrim House, Newcastle-on-Tyne.
Telegrams: "Doric," Newcastle-on-Tyne. National Telephone No. 2497.

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GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
Firth Blakeley, Sons, and Company, Limited, Church Fenton, near Leeds.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
Joseph Taylor and Co., Central Plumbing Works, Bolton.
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HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
Read Holliday and Sons, Ltd., Huddersfield.

CRIPPS' "GUIDE-FRAMING OF GASHOLDERS."

ANY number of copies of this Book will be PURCHASED at a good price.
Inquiries to No. 5840, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Copy of Herring's "Gas- WORKS CONSTRUCTION." Must be in Good Condition.
Communicate with William Coward and Co., Ltd., 100, Bishopsgate, E.C.

APPLICANTS for the Position of Gas- FITTER AND RELIEF MANAGER to the Devon Gas Association, Limited, are THANKED, and notified that the APPOINTMENT HAS NOW BEEN FILLED.

THE Sutherland Meter Company, Witton, Birmingham, require a Smart REPRESENTATIVE with Good Connection in Meters and Lighting. Exceptionally Good Salary offered for Suitable Man.
All Communications will be treated Confidentially.

GAS-COAL Representatives.—Large Firm of Factors require Two or Three for the Sale of Gas Coal, Cannel, &c.
None but Experienced Salesmen need Apply.
Apply, by letter, giving References and full Qualifications, to No. 5844, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

CARDIFF GASLIGHT AND COKE COMPANY.

ASSISTANT-ENGINEER.

APPLICATIONS are invited for the Position of ASSISTANT-ENGINEER to the above Company. Candidates to be over 28 years of Age, and Fully Qualified. Constructional and Management Experience of a Large Gas-Works essential. Some Practical Knowledge of the Vertical Retort System, also Distribution Work, Desirable.
Commencing Salary £300 per Annum.
Applications, stating Age, Experience, and Present Appointment, together with *copies* of Three Recent Testimonials, to be addressed to the Chairman, and forwarded, not later than March 2 next, to the undersigned, from whom Further Particulars may be Obtained.
Canvassing directly or indirectly will disqualify.
George Clarry,
General Manager and Secretary.
Cardiff,
Feb. 10, 1914.

WANTED, Experienced Draughtsman used to Detailing Retort-Bench Ironwork, Settings, and Structural Work.
Apply, stating Age, Experience, and Salary required, to Gibbons Bros., Ltd., Dibdale Works, Dudley, Worcs.

A COMPETENT Salesman required for a Gas Company opening up the Commercial and Fittings Business. The Applicant will be required to have a thorough Knowledge of Gas Sales in all Branches, and be competent to Quote and Recommend Suitable Schemes for Lighting, Heating, and Power Purposes, at the same time to Superintend the Company's Show-Room.
Salary, £200 per Annum.
Applications to be sent on or before the 4th of March, 1914, to No. 5846, care of Mr. King, 11, Bolt Court, Fleet Street, London, E.C.

WASTE INSPECTOR.

WANTED, a Waste and Fittings Inspector. Previous Experience and Knowledge of Practical Plumbing and Fitting Essential. Wages, 30s. weekly, with Uniform and 2s. weekly Allowance for Bicycle. Age between 24 and 30 Years.
Apply, enclosing *copies* of not more than Three recent Testimonials, not later than the 2nd of March, 1914, to H. J. Crane, Manager, Woking Water and Gas Company, Woking.

GAS-WORKS.—Wanted to Purchase, for Cash, a Small GAS-WORKS. Preference given to one where there is Scope for Further Development.
Write, giving full Particulars, to "D. G.," Scripps's Advertising Offices, 13, South Molton Street, W.

RETORTS FOR SALE.

FOURTEEN 22 in. by 16 in. by 10 ft. OVALS, closed end.
Nine 21 in. by 14 in. by 10 ft. OVALS, closed end.
Eight 18 in. by 14 in. by 10 ft. OVALS, closed end.
In lots to suit Purchasers.
For Particulars, apply Cork Gas Consumers' Company, Gas-Works, Cork.

REMINGTON, No. 7 Typewriter. New Condition. Cost over £20. Sacrifice £6 10s. Free Approval. Carriage paid. No dealers.
Address, White, Arcade, Northampton.

THE Corporation of Middleton invite TENDERS for TUBES and FITTINGS, OIL, LIME, VITRIOL, &c., required in the Gas Department for the Year ended the 31st of March, 1915.
Tenders, addressed to the Chairman of the Gas Committee, must be Delivered in Official Envelopes at my office not later than the 10th of March next.
Further Particulars and Form of Tender may be obtained from Mr. W. H. A. Chester, Gas Engineer, Gas-Works, Middleton.
The Corporation do not bind themselves to accept the lowest or any Tender.
Frederick Entwistle,
Town Clerk.
Town Hall, Middleton,
Feb. 13, 1914.

CORPORATION OF CALCUTTA.

TENDERS are invited, in duplicate, for 400 Gross (Four Hundred Gross) of JENA GLASS CYLINDERS for Mansfield Paten Inverted Burners. Outside dimensions 2⅛ inches (Two and One-Eighth inches) at top; 2⅜ inches (Two and Three-Fourths inches) at bottom; and 3 inches (Three inches) long, with Three Lugs projecting ⅛ (One-Eighth) of an inch for the purpose of securing to holder.
Half quantity to be Delivered within Two Months and the Balance within Four Months of Receipt of Order. Delivered Free of all Charges at Lighting Stores, Calcutta, including Insurance against Breakages.
All Cylinders must be marked "C.C." Sample of the Cylinders quoted for should be sent with the Tenders.
Tenderers must quote a Price per Gross.
The Corporation do not bind themselves to accept the lowest or any Tender.
Payment will be made when Delivery is accepted.
Tenders will be received by the Vice-Chairman of the Corporation up to 12 noon on Monday, March 23, 1914, when they will be opened in the presence of such Tenderers as may be present. Each Tender must be enclosed in Sealed Cover and superscribed "Tender for Jena Glass Cylinders."
No Tenders will be considered unless accompanied by a Remittance to the extent of 2½ per cent. on the value of such Tender.
The Rates Offered by the Tenderer will be in force for the whole year.
Tenderers must abide by the Rules in regard to Tenders in vogue in the Corporation.
C. C. Chatterjee,
Secretary to the Corporation.
Municipal Office.
The 21st of January, 1914.

TO ENGINEERS AND IRONFOUNDERS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the Supply and Erection of Two CONDENSERS, each consisting of 42 Lines of 18 inch diameter Pipes, with Bottom Boxes and Supporting Girders, all made of Cast-Iron, for their Grimesthorpe Station.
Drawings may be seen, and Specification with Form of Tender and Bill of Quantities obtained, upon Application to the Engineer, Mr. J. W. Morrison, M.Inst.C.E., at the Company's Office, Commercial Street.
The Directors do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, endorsed "Tender for Condensers," must be Delivered by post to Mr. Hanbury Thomas, Managing-Director, not later than the First Post on Tuesday, March 3.
Wm. Hamby,
Secretary.
Commercial Street,
Sheffield, Feb. 5, 1914.